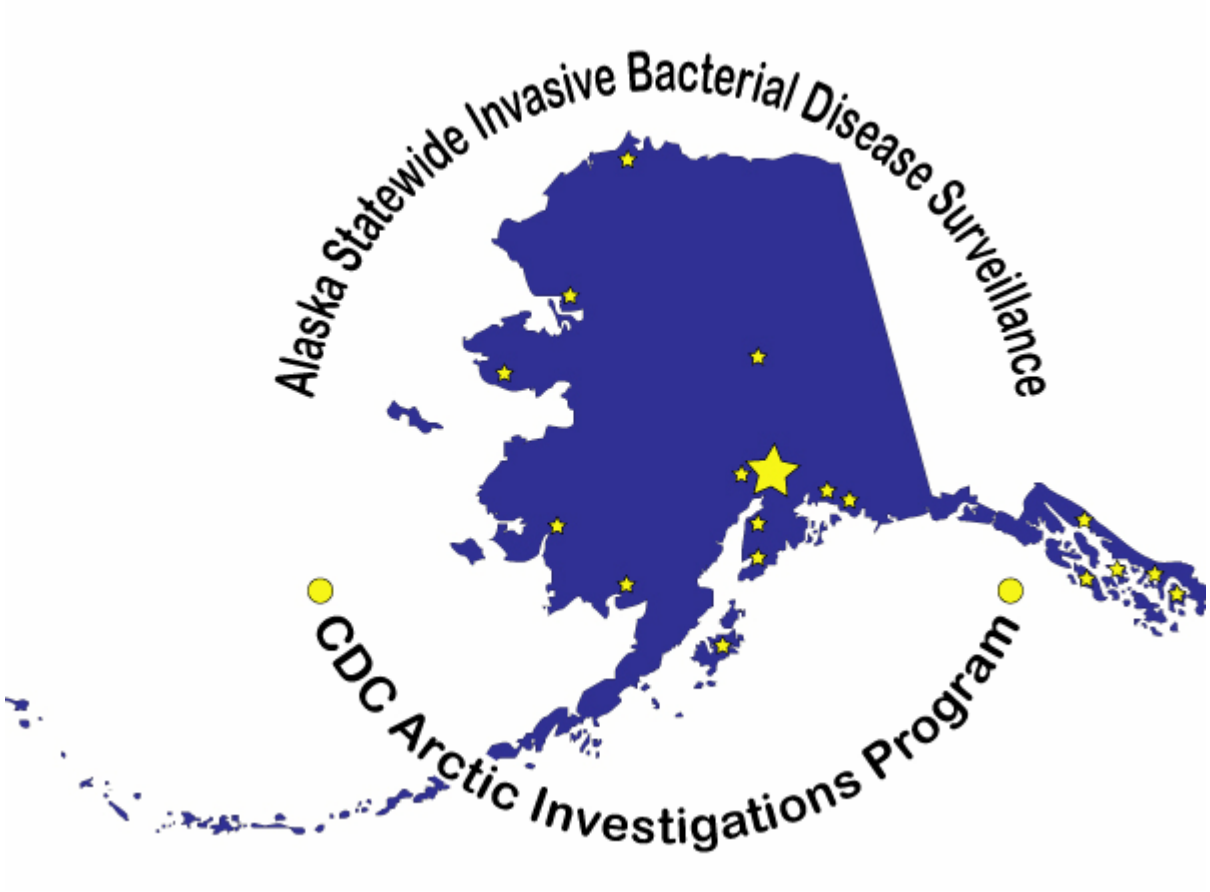

Surveillance of Invasive Bacterial Disease in Alaska, 2003

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Alaska Statewide Invasive Bacterial Disease

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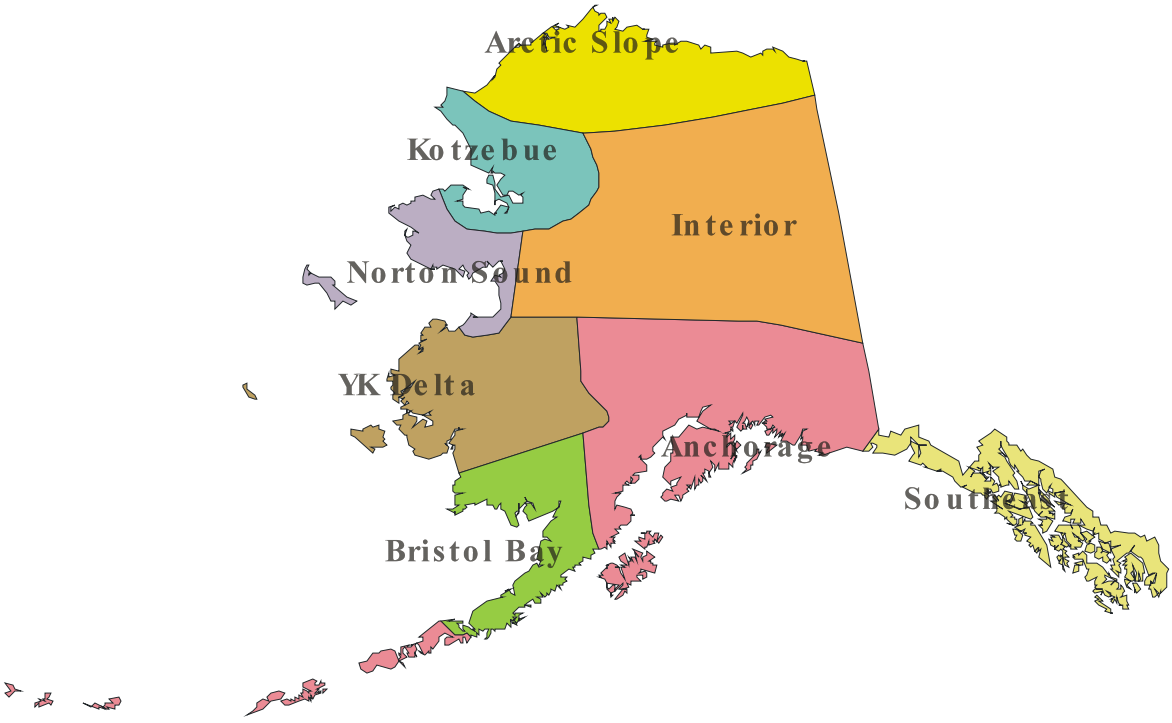
Summary

The Centers for Disease Control and Prevention's Arctic Investigations Program (AIP) in Anchorage, Alaska, maintains a statewide surveillance system for invasive diseases caused by *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Neisseria meningitidis*, and groups A and B streptococci. Laboratories throughout the state are requested to send to AIP any isolates of these organisms recovered from a blood culture, CSF, or other normally sterile site. Isolate identification is confirmed and, when appropriate, serotyped and tested for antimicrobial susceptibility. The objectives of this system are to provide information on disease rates within the state, monitor the emergence of antimicrobial resistance, and to monitor the effectiveness of implemented vaccine programs, such as the 23-valent pneumococcal polysaccharide vaccine, the 7-valent pneumococcal conjugate vaccine and *Haemophilus influenzae* type b vaccines.

Figure 1: Invasive Bacterial Disease Surveillance Regions – Alaska, 2003



In 2003, the total number of cases of invasive disease caused by these organisms reported to AIP were 98 *S. pneumoniae*, 18 *H. influenzae*, 4 *N. meningitidis*, 23 group A strep and 20 group B strep. Alaska Native populations had higher rates of disease than non-Native populations in all invasive disease except those caused by Group B streptococcus. Rates of invasive pneumococcal disease were highest in Norton Sound; *H. influenzae* rates were highest in YK Delta. Rates for each organism by region are presented in the following tables.

Table 1: Surveillance Organisms Reported by Region – Alaska, 2003

Region	*S. pneumoniae* n (rate*)	*H. influenzae* n (rate*)	*N. meningitidis* n (rate*)	Group A Strep n (rate*)	Group B Strep n (rate*)
Anchorage	52 (12.2)	8 (1.9)	3 (0.7)	16 (3.8)	15 (3.5)
Arctic Slope	1 (16.2)	0 (0)	0 (0)	1 (16.2)	0 (0)
Bristol Bay	1 (13.7)	0 (0)	0 (0)	1 (13.7)	0 (0)
Interior	13 (13.7)	0 (0)	0 (0)	1 (1.1)	2 (2.1)
Kotzebue	4 (49.8)	0 (0)	0 (0)	0 (0)	0 (0)
Norton Sound	12 (128.1)	0 (0)	0 (0)	0 (0)	0 (0)
Southeast	9 (12.5)	2 (2.8)	1 (1.4)	2 (2.8)	3 (4.2)
YK Delta	6 (24.4)	8 (32.6)	0 (0)	2 (8.1)	0 (0)
Total	98 (15.1)	18 (2.8)	4 (0.6)	23 (3.5)	20 (3.1)

*Cases per 100,000

Introduction

AIP conducts statewide surveillance of invasive *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Neisseria meningitidis*, and groups A and B streptococcus. This program is part of a passive, laboratory-based surveillance system in which laboratories from all hospitals throughout the state are encouraged to participate. The population included in the AIP surveillance is the State of Alaska, which totaled 648,818 persons in 2003 *(Alaska Department of Labor & Workforce Development, http://almis.labor.state.ak.us; 8/6/2004)*. Case detection occurs year-round as participating laboratories send isolates recovered from sterile sites to the AIP lab in Anchorage, accompanied by basic demographic and clinical information on the cases. Materials and forms for isolate shipment and data collection are provided to each lab by AIP. At year-end, AIP asks that each laboratory review their records and provide information on any cases that may have been overlooked. In 2003, 23 labs in Alaska participated in the invasive disease surveillance system, either by sending isolates to the AIP lab throughout the year, conducting year-end record reviews, or both.

AIP defines a case of invasive *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Neisseria meningitidis*, or groups A and B streptococcus as an isolate of the bacteria from a normally sterile site, including blood, cerebrospinal fluid, pleural fluid, peritoneal fluid or joint fluid that has been taken from a resident of Alaska. In addition, for group A streptococcus, isolates are requested from deep tissue infections such as might be collected from surgical debridement of cases of necrotizing fasciitis.

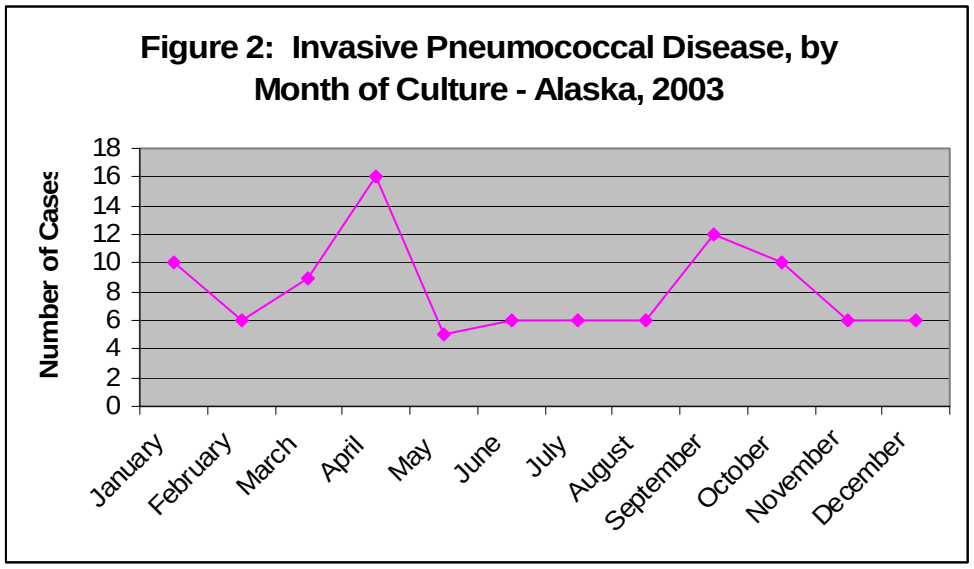
Invasive Pneumococcal Disease

Overall Incidence

A total of 89 pneumococcal isolates were received at AIP in 2003. An additional 9 cases were detected through year-end follow up with participating labs throughout the state for a total of 98 cases of invasive pneumococcal disease. The overall invasive pneumococcal case rate for 2003 was 15.1 per 100,000 persons per year. Alaska rates for 2003 were slightly higher than the Active Bacterial Core Surveillance (ABCs) 2003 national projected rate of 13.8/100,000 (*Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network Streptococcus pneumoniae, 2003 - preliminary*). ABCs is a surveillance system operated in 9 states which covers a population of over 36 million persons.

Seasonality

Invasive *Streptococcus pneumoniae* cases were identified in each month of 2003. The largest number of cases was reported in April.



Race

In 2003, the state population was comprised of 19% Alaska Natives (*Alaska Department of Labor & Workforce Development: http://almis.labor.state.ak.us 2/1/2005; Alaska Natives 124,122, non-Natives 524,696)*. The percentage of all reported *S. pneumoniae* cases that occurred in 2003 among Alaska Natives was 58%; for a total of 57 cases resulting in an age-adjusted rate of 47.6/100,000 persons per year. Forty-one cases occurred among the non-Native population for an age-adjusted rate of 7.4/100,000 persons per year. The rate ratio of age-adjusted rates of *S. pneumoniae* disease for the Alaska Native population compared with the non-Native population in 2003 is 6.4.

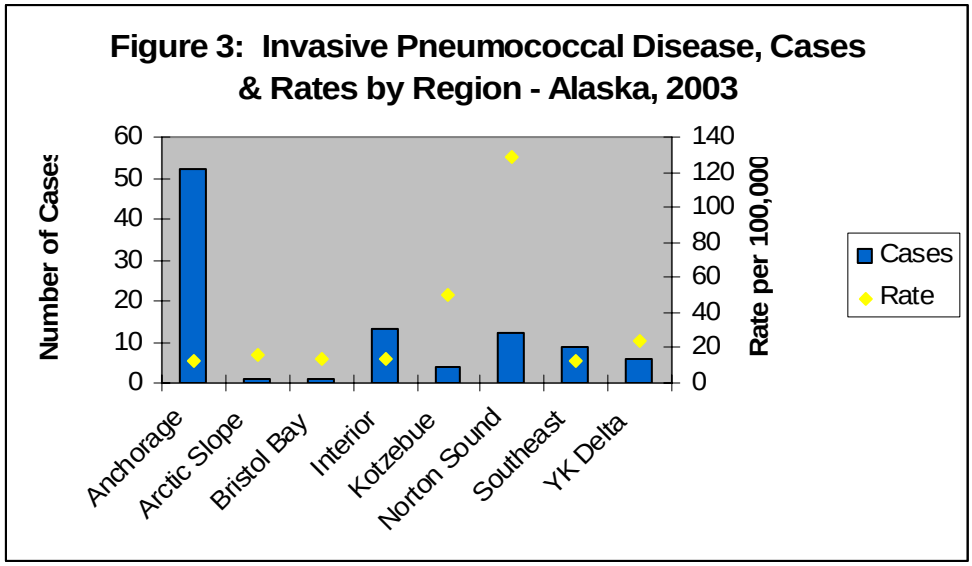
Table 2: Invasive *Streptococcus pneumoniae* Cases by Race – Alaska, 2003

Race	Cases n (%)	Age Adjusted Rate*	% Male	Deaths n (%)
Alaska Native	57 (58)	47.6	51	6 (11)
Non-Native†	41 (42)	7.4	66	4 (10)‡
Total	98		57	10 (10)

*Cases per 100,000 per percent distribution of Alaska 2000 population
†Includes 3 cases for which race was unknown
‡Outcome unknown for 1 case

Region

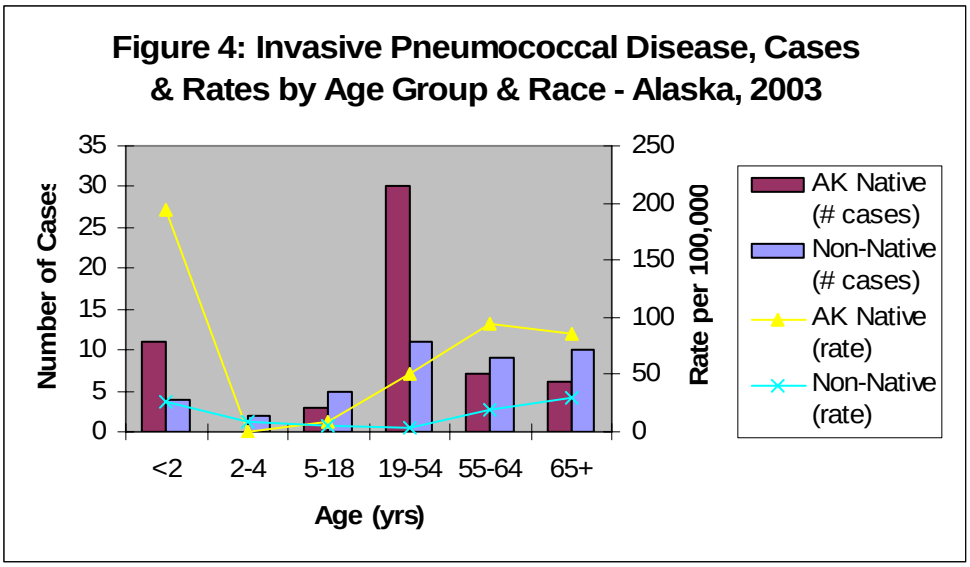
The highest percentage (53%) of invasive pneumococcal disease cases occurred in the Anchorage area in 2003. Rates of disease, however, were highest in Norton Sound, 128.1/100,000 persons per year.



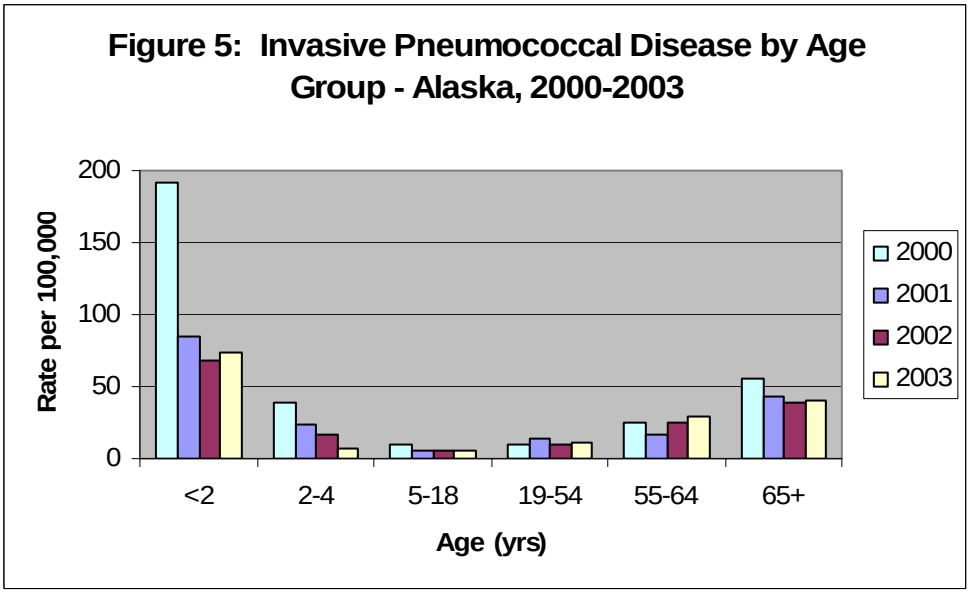
Age

Cases occurred in all age groups in 2003 ranging from 0.3 years to 88.4 years with a median of 48.1 years. Overall, the highest rates of disease occurred in children less than 2 years old.

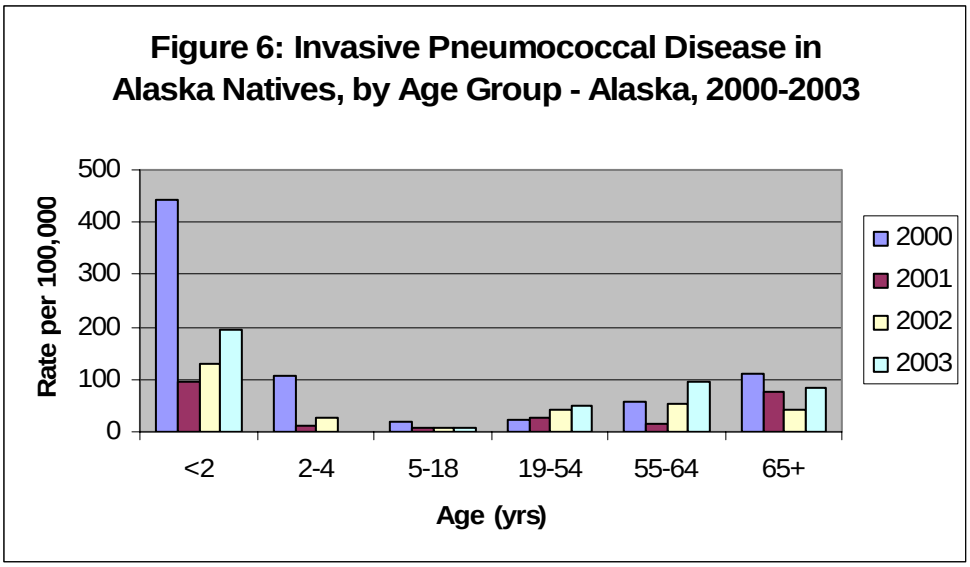
When stratified by age and race, the highest rates of disease in 2003 occurred in Alaska Native children less than 2 years old (193.4/100,000 persons per year). However, there were no cases of invasive pneumococcal disease in AK Native children 2-4 years of age.

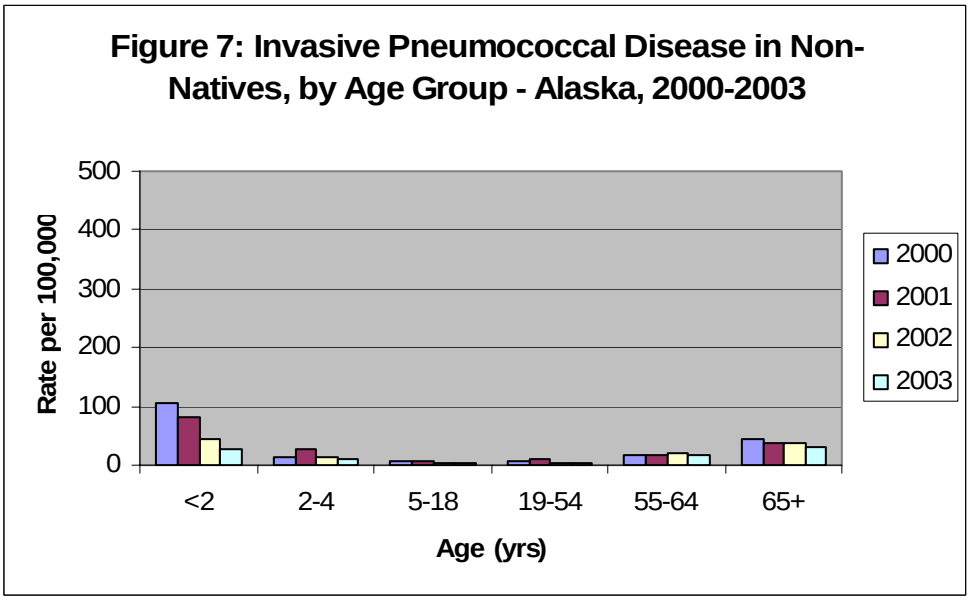


Since the initiation of a pneumococcal conjugate vaccine program in 2001, overall rates of invasive disease have declined dramatically in children less than 5 years of age. In 2000, overall yearly rates of pneumococcal disease in children less than 2 years were 191.2/100,000, dropping to 67.9/100,000 in 2002 and 73/100,000 in 2003.



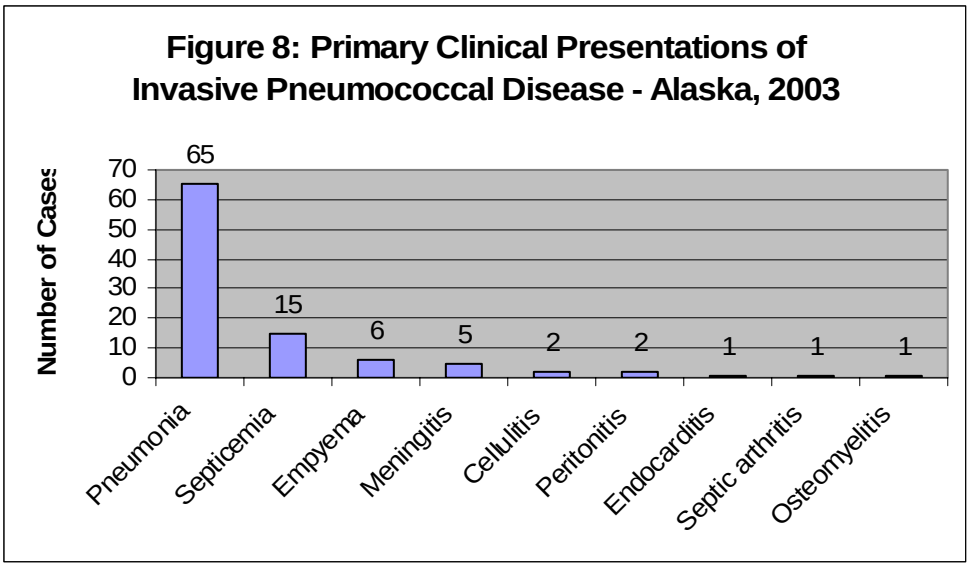
Although pneumococcal disease rates dropped in AK Native and non-Native children less than 2 years after 2000, the rates of disease in AK Native children less than 2 years have been trending upward from a low of 93.6/100,000 in 2000 to 130.7/100,000 in 2001 and 193.4/100,000 in 2003. Rates of invasive disease in non-Native children less than 2 years have continued to decline during the same time period.





Clinical Presentation

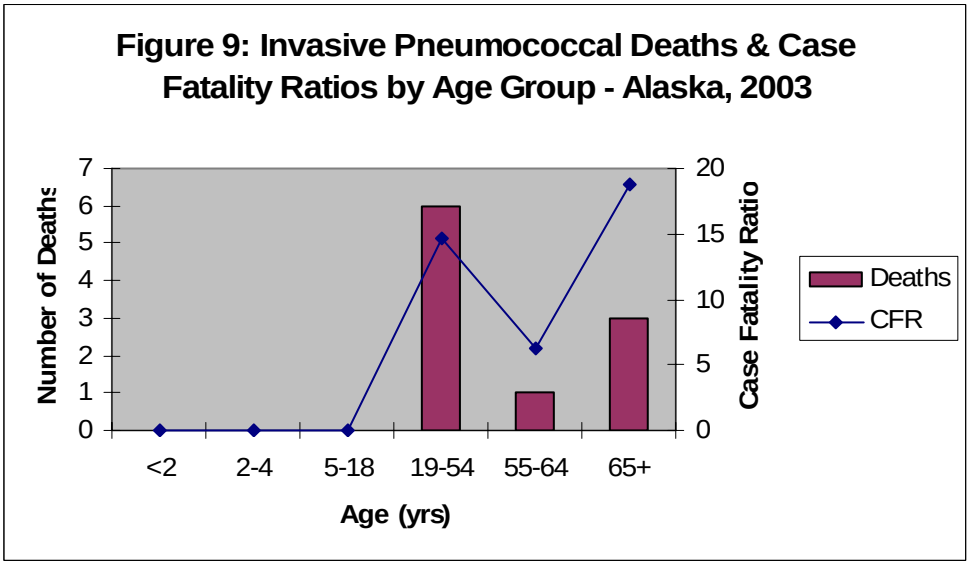
The primary clinical presentation was determined by a review of the discharge diagnoses in each patient's individual medical record associated with the invasive bacterial illness. In cases with multiple discharge diagnoses, the most serious diagnosis related to the pneumococcal infection was recorded as the primary clinical presentation. Pneumonia was the most common primary clinical presentation in 2003 (66%) followed by septicemia (15%). Nine cases had a secondary pneumococcal-related diagnosis in 2003; 7 pneumonia and 1 each endocarditis and septic arthritis.



In 2003, blood was the most common source of a positive culture which was used to identify 89 (91%) of 98 cases. Pleural fluid was the positive site for 4% of cases and cerebrospinal fluid for 3%. The remaining cases were identified through joint fluid and another unidentified sterile site (1 case each).

Mortality

In 2003, the overall case fatality ratio for *S. pneumoniae* in Alaska was 10% (10 deaths out of 98 cases). The case fatality ratio for non-Natives was similar to Natives; 10% (4 deaths) and 11% (6 deaths), respectively. Although the majority of deaths occurred in the 19-54 year old age category (7 deaths), the highest case fatality ratio occurred in the 65+ age category; 18.8% (3 deaths).



Serotype

Serotyping of invasive pneumococcal isolates is performed at AIP using internationally standardized methods. Serotype identification is based on the organism's polysaccharide capsule which is a principal virulence factor for pneumococci. This information provides a way to subtype organisms and to determine if the infection was due to a type that could be prevented by use of one of the two available pneumococcal vaccine types. Serotyping was performed on all of the *S. pneumoniae* cases for which an isolate was available.

Table 3: Invasive Pneumococcal Serotype Distribution by Race and Age Group – Alaska, 2003

		Alaska Native				Non-Native				Unknown
Serotype	Total n (%)	<2	2-18	19-64	65+	<2	2-18	19-64	65+	All Ages
03	8 (9)	-	-	4	-	-	-	-	3	1
04	6 (6.7)	-	-	-	-	-	-	2	2	2
06A	2 (2.2)	-	1	-	1	-	-	-	-	-
06B	1 (1.1)	-	-	-	-	-	-	1	-	-
07C	1 (1.1)	-	-	-	-	-	-	1	-	-
07F	2 (2.2)	-	-	1	-	-	-	1	-	-
08	8 (9)	-	-	7	-	-	-	-	1	-
09V	1 (1.1)	-	-	-	-	-	-	1	-	-
10A	3 (3.4)	1	-	1	1	-	-	-	-	-
11A	1 (1.1)	-	-	1	-	-	-	-	-	-
12F	11 (12.4)	-	1	9	-	-	1	-	-	-
13	1 (1.1)	1	-	-	-	-	-	-	-	-
14	2 (2.2)	-	-	1	-	1	-	-	-	-
15A	1 (1.1)	-	-	1	-	-	-	-	-	-
15B	1 (1.1)	-	-	-	-	-	-	-	1	-
15C	2 (2.2)	1	-	-	-	-	-	1	-	-
16F	4 (4.5)	-	-	2	-	-	-	2	-	-
17F	1 (1.1)	-	-	-	-	-	-	-	1	-
18C	3 (3.4)	1	-	1	-	-	-	1	-	-
19A	15 (16.9)	5	1	3	2	1	1	2	-	-
19F	3 (3.4)	-	-	1	-	-	-	2	-	-
20	1 (1.1)	-	-	1	-	-	-	-	-	-
22F	3 (3.4)	-	-	1	-	-	1	1	-	-
23A	1 (1.1)	-	-	1	-	-	-	-	-	-
23F	1 (1.1)	-	-	-	-	-	1	-	-	-
33F	1 (1.1)	-	-	-	-	1	-	-	-	-
37	1 (1.1)	-	-	1	-	-	-	-	-	-
38	4 (4.5)	1	-	-	-	1	-	2	-	-
Total	89	10	3	36	4	4	4	17	8	3

In 2003, the most common serotypes were 19A (15 isolates, 16.9%) and 12F (11 isolates, 12.4%). From 1986 through 2001, serotype 14 was the most common invasive pneumococcal serotype ranging from 7.4% to 23.5% of isolates. Following introduction of the pneumococcal conjugate vaccine in 2001 which includes serotype 14, the proportion of serotype 14 isolates has dropped to 2.2% in 2003. However, disease caused by serotype 19A, which is not included in the conjugate vaccine, increased. Prior to 2003, yearly numbers of cases of serotype 19A disease and the proportion of total isolates have ranged from 2 to 7 and 1.6% to 6.1%, respectively. The majority (73%) of serotype 19A disease occurred in AK Natives; cases occurred in all age groups and in various regions across the state. An outbreak of serotype 12F disease was identified through surveillance and was reported (*Centers for*

Disease Control and Prevention. Outbreak of Invasive Pneumococcal Disease – Alaska. MWR 2005;54:72-75.).

Table 4: Invasive Pneumococcal Serotype Distribution by Region – Alaska, 2003

Serotype	Anchorage	Arctic Slope	Bristol Bay	Interior	Kotzebue	Norton Sound	Southeast	YK Delta
03	5	-	-	1	-	-	-	2
04	6	-	-	-	-	-	-	-
06A	-	-	-	1	-	-	-	1
06B	1	-	-	-	-	-	-	-
07C	-	-	-	-	-	1	-	-
07F	-	-	-	1	-	1	-	-
08	7	-	1	-	-	-	-	-
09V	1	-	-	-	-	-	-	-
10A	-	-	-	2	-	-	-	1
11A	1	-	-	-	-	-	-	-
12F	3	-	-	-	-	7	1	-
13	1	-	-	-	-	-	-	-
14	1	-	-	-	-	-	1	-
15A	1	-	-	-	-	-	-	-
15B	1	-	-	-	-	-	-	-
15C	-	-	-	-	1	-	1	-
16F	2	-	-	2	-	-	-	-
17F	-	-	-	1	-	-	-	-
18C	1	-	-	-	-	-	2	-
19A	7	1	-	1	3	-	1	2
19F	1	-	-	1	-	-	1	-
20	1	-	-	-	-	-	-	-
22F	1	-	-	1	-	1	-	-
23A	-	-	-	1	-	-	-	-
23F	1	-	-	-	-	-	-	-
33F	-	-	-	-	-	-	1	-
37	1	-	-	-	-	-	-	-
38	3	-	-	-	-	1	-	-
Total	46	1	1	12	4	11	8	6

Vaccine Serotypes

Two vaccine types are licensed for prevention of pneumococcal disease. In 2001, the pneumococcal conjugate vaccine (PCV7) was included in the Alaska childhood vaccination schedule. This vaccine provides protection against the 7 most common pneumococcal serotypes causing invasive disease

among children (types 4, 6B, 9V, 14, 18C, 19F, 23F). The table below shows the proportion of invasive infections from 2003 that were due to serotypes found in the PCV7 vaccine.

Table 5: Proportion of Invasive Isolates Contained in the PCV7 Vaccine by Age Group and Race – Alaska, 2003

Age (yrs)	Alaska Native (%)	Non-Native (%)	Total (%)
<2	1 (10%) of 10	1 (25%) of 4	2 (14%) of 14
2-4	0 (0%) of 0	1 (50%) of 2	1 (50%) of 2
5+	3 (7%) of 43	9 (30%) of 30	12 (16%) of 73
Total	4 (8%) of 53	11 (31%) of 36	15 (17%) of 89

The 23-valent polysaccharide vaccine (Ps23V) is recommended in Alaska for all persons 55 years and older, and for persons over age 2 who are at higher risk for pneumococcal disease. Revaccination is recommended after 6 years. In 2003, for persons 55 years and older, 25 (93%) of 27 cases serotyped were potentially vaccine preventable invasive pneumococcal illnesses.

Vaccination Failures

In 2003, pneumococcal vaccine status was known for 64 (65%) of the 98 cases; 38 cases (39%) did receive a pneumococcal vaccine prior to illness and 26 cases (27%) had no record of a pneumococcal vaccine.

A PCV7 vaccine failure is defined as invasive pneumococcal disease caused by a serotype contained in the PCV7 vaccine in a child less than five years old who has had at least two doses of vaccine. There were two vaccine failures in 2003; one was in a 17-month old and one in a 2-year old. Both children received three doses of vaccine. The 17-month old presented with pneumonia and had no underlying illnesses or risk factors; the isolate from the case was serotype 18C. The 2-year old, who had diabetes and asthma, presented with pharyngitis; the isolate from the case was serotype 23F.

One of the 10 deaths in 2003 from invasive *S. pneumoniae* was due to a serotype (03) found in the Ps23V vaccine. This death did not occur in a person in the age group for which vaccine is recommended, however, the individual had received vaccine. Time since vaccination was 9 years.

Table 6: Invasive Pneumococcal Disease, Serotypes of Fatal Cases – Alaska, 2003

Serotype	Deaths (%)	Serotype Frequency
03†	2 (33)	6
04*†	1 (16.7)	6
12F†	1 (9)	11
15B†	1 (100)	1
16F	2 (50)	4
23A	1 (100)	1
38	1 (25)	4

*Serotypes contained in the PCV7 vaccine
†Serotypes contained in the 23-valent polysaccharide vaccine

Overall, 56% of all pneumococcal-related mortality in 2003 was potentially preventable with the use of the 23-valent polysaccharide vaccine in persons over 2 years old.

Table 7: Potentially Vaccine Preventable Invasive Pneumococcal Deaths – Alaska, 2003

	< 2 years	2-4	5-18	19-54	55-64	65+	Total
PCV7	0	0	0	0	1 (100%)	0	1 (11%)
Ps23V	0	0	0	2 (33%)	1 (100%)	2 (100%)	5 (56%)
Total	0	0	0	6	1	2	9

Associated Medical Conditions

The presence of one or more associated medical conditions was reported in 84% of invasive pneumococcal cases in 2003. Alcohol use was the most prevalent risk factor observed in adults followed closely by cigarette smoking.

Table 8: Associated Medical Conditions Identified in Invasive Pneumococcal Cases – Alaska, 2003*

Medical Condition	Adult Cases (≥ 18 years) n=73, Cases (%)
Alcohol abuse	36 (49)
Cigarette smoking	32 (44)
Chronic lung disease	22 (30)
Diabetes	11 (15)
Immunosuppressive treatment	4 (5)
Injection drug use	2 (3)
Asplenia	2 (3)

*More than one risk factor was identified in several cases

Antibiotic Resistance

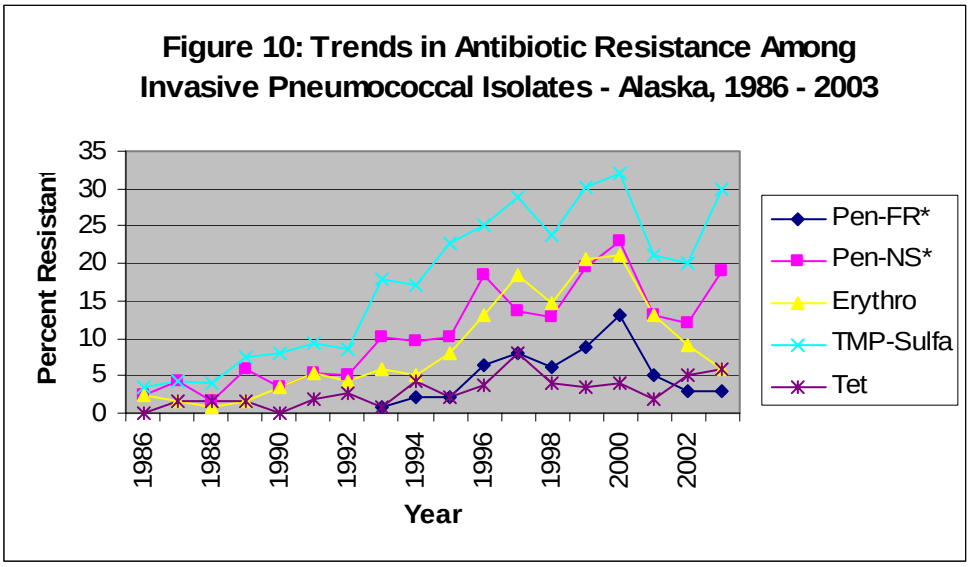
Susceptibility testing was performed on all isolates in 2003. Results of the testing are presented in the following table.

Table 9: Antibiotic Resistance in Invasive *Streptococcus pneumoniae* Isolates – Alaska, 2003

Antibiotic	Susceptible	Intermediate	Resistant	I + R	Total Tested
Penicillin	72 (81%)	14 (16%)	3 (3%)	17 (19%)	89
TMP-sulfa	65 (73%)	10 (11%)	16 (19%)	26 (30%)	89
Erythromycin	83 (94%)	0	5 (6%)	5 (6%)	88
Ceftriaxone	86 (97%)	3 (3%)	0	3 (3%)	89
Tetracycline	84 (94%)	0	5 (6%)	5 (6%)	89
Chloramphenicol	87 (98%)	0	2 (2%)	2 (2%)	89
Rifampin	88 (100%)	0	0	0	88
Vancomycin	89 (100%)	0	0	0	89
Levoflox	89 (100%)	0	0	0	89
Clindamycin	77 (97%)	0	2 (3%)	2 (3%)	79

Cut points from the Minimum Inhibitory Concentration (MIC) Interpretive Standards were used to determine if an isolate was 'susceptible', 'intermediate', or 'resistant' to the antibiotic being tested (*National Committee for Clinical Laboratory Standards (NCCLS) MIC Testing, Supplemental Tables, M100-S10 (M7), January, 2000*). The MIC Interpretive Standards definitions of 'susceptible', 'intermediate', and 'resistant' can be found in the Appendix.

Serotypes found in the PCV7 vaccine are more likely to be non-susceptible to penicillin and erythromycin than non-vaccine serotypes. One potential benefit of the vaccine is an anticipated decline in antibiotic resistance among circulating pneumococci. The data in the following graph supports this assumption; since the initiation of the PCV7 vaccine in 2001, antibiotic resistance has dropped. However, during 2003, TMP-sulfa resistance has increased from 20% of isolates tested in 2002 to 30% and penicillin non-susceptible isolates from 13% in 2002 to 19%.



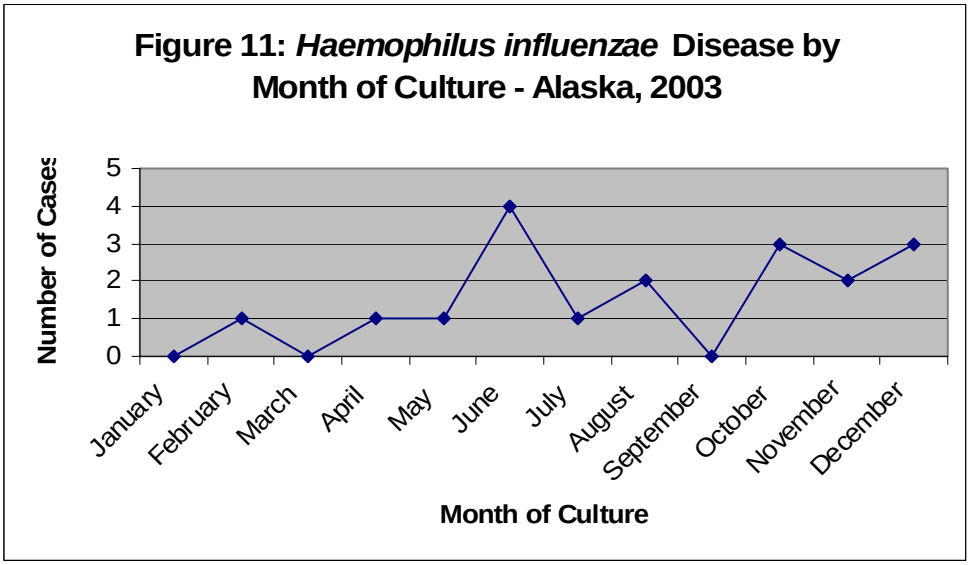
*Pen-FR = fully resistant, Pen-NS = non-susceptible

Invasive *Haemophilus influenzae*

Overall Incidence

In 2003, there were 18 cases of invasive *Haemophilus influenzae* in Alaska, for a statewide rate of 2.8/100,000 persons per year. This rate is higher than the national projected rate of 1.3/100,000 persons per year, as stated in the *Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network Haemophilus influenzae, 2003 - preliminary*. In 2003, four *Haemophilus influenzae* cases resulted in death, giving a case-fatality ratio of 22%.

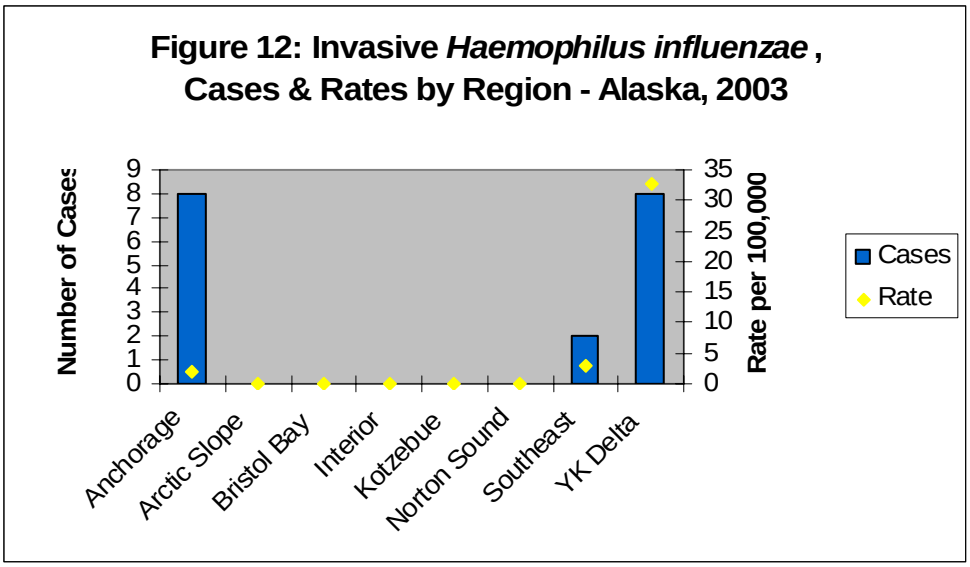
Seasonality



Due to the small number of cases, trends in seasonality cannot be determined.

Region

The Anchorage (8 cases, 44%) and Yukon-Kuskokwim Delta (8 cases, 44%) areas had the highest numbers of reported cases and percentages of reported cases. The Yukon-Kuskokwim Delta area, however, had the highest disease rate of 32.6/100,000 persons per year and is eight times the 2002 rate of 4.1/100,000. The Southeast region had two cases.



Race

Table 10: Invasive *Haemophilus influenzae* Cases by Race – Alaska, 2003

Race	Cases n (%)	Age Adjusted Rate *	% Male	Deaths n (%)
Alaska Native	11 (61)	7.3	54.6	1 (9)
Non-Native	7 (39)	1.3	57.1	3 (43)
Total	18		55.6	4 (22)

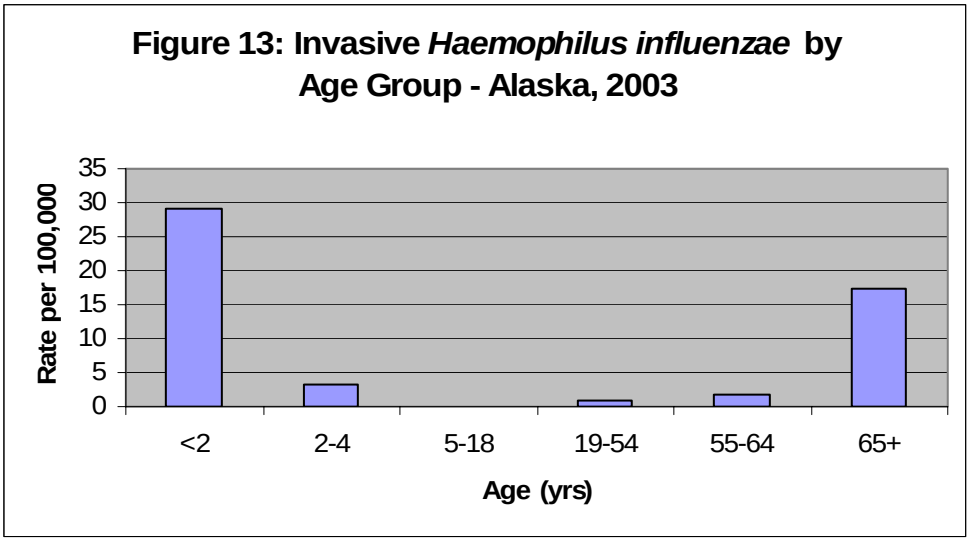
*Cases per 100,000 per percent distribution of Alaska 2000 population

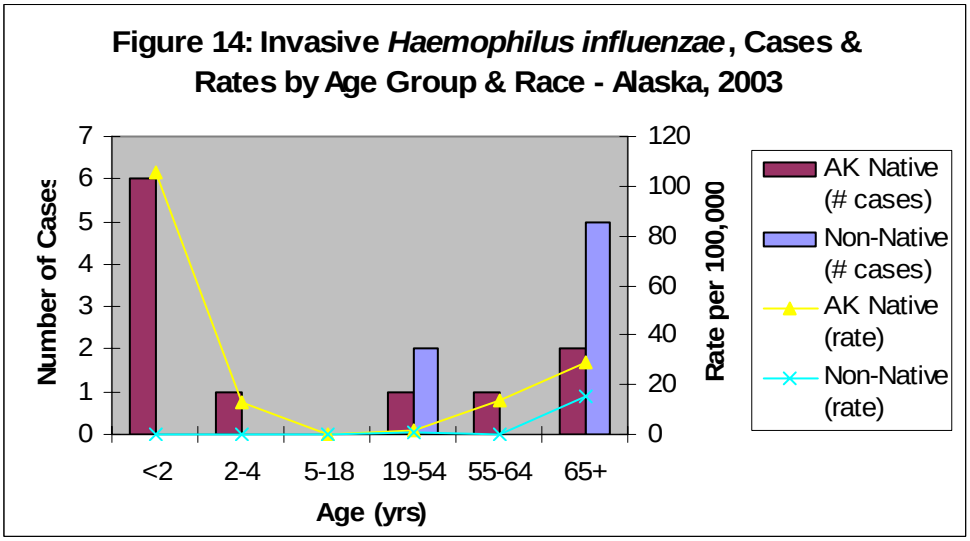
In 2003, 61% of the cases occurred in Alaska Natives. Age-adjusted rates were calculated for Alaska Natives and non-Natives. The age-adjusted rate ratio of *H. influenzae* disease for the Alaska Native population compared with the non-Native population in 2003 was 5.6.

Age

Haemophilus influenzae cases ranged in age from less than 1 year to 82 years of age in 2003 (median 47.8 years). Overall, the highest rates of disease occurred in children less than 2 years old and in adults greater than 65 years old.

Rates of disease in Alaska Native versus non-Native populations by age group were variable; overall numbers of cases and rates by race and age group are presented in Figure 14. The highest rates of disease occurred in Alaska Natives children less than two years of age (105.5/100,000 persons per year) and adults greater than 65 years old (28.6/100,000 persons per year). There were no cases of *Haemophilus influenzae* in non-Native children less than 18 years old and none reported in the 5-18 year old age groups in AK Natives. In adult age categories, there were no *H. influenzae* cases reported in non-Natives 55-64 years old.





Clinical Presentation

The primary clinical presentation was determined by a review of the discharge diagnoses in each patient's individual medical record associated with the invasive bacterial illness. For cases with more than one diagnosis, the most serious *Haemophilus influenzae*-related diagnosis was recorded as the primary clinical presentation. In 2003, four cases had a secondary *Haemophilus influenzae*-related diagnosis; 2 each pneumonia and cellulitis with bacteremia.

Haemophilus influenzae was isolated from 17 (94%) blood samples and 1 (6%) joint fluid sample.

Table 11: Primary Clinical Presentation of Invasive *Haemophilus influenzae* - Alaska, 2003

Primary Presentation	n (%)
Pneumonia*	7 (39)
Septicemia	6 (33)
Meningitis	2 (11)
Septic arthritis	2 (11)
Empyema	1 (6)
Total	18

*with bacteremia

Serotypes

All isolates received at AIP are serotyped. The bacterial capsule is the basis for serotyping and is the primary virulence factor. Serotype b has been the most common serotype in the past, but its prevalence has decreased with use of the childhood Hib vaccine. Surveillance of serotypes is important for monitoring vaccine effectiveness and emergence of non-vaccine serotypes.

Table 12: Serotypes of Invasive *Haemophilus influenzae* Cases by Race – Alaska, 2003

		Alaska Native				Non-Native			
Serotype	Total n (%)	<2	2-18	19-64	65+	<2	2-18	19-64	65+
a	6 (33)	5	-	-	-	-	-	1	-
b	2 (11)	1	-	1	-	-	-	-	-
c	1 (6)	-	-	-	-	-	-	-	1
d	1 (6)	-	1	-	-	-	-	-	-
f	1 (6)	-	-	-	-	-	-	-	1
NT*	7 (39)	-	-	1	2	-	-	1	3
Total	18	6	1	2	2	0	0	2	5

*Non-typable

In 2003, the most common serotype was a; 83% occurred in AK Native children less than 2 years. Seven cases were non-typable. An outbreak of serotype a disease in infants was detected through surveillance and will be reported in *The Pediatric Infectious Disease Journal* in spring, 2005.

Hib

In recent years, the prevalence of *Haemophilus influenzae* type b has declined due to increased use of a childhood vaccine against this serotype. Two cases of Hib occurred in 2003; one in a 13 month old male AK Native and one in a 47 year old AK Native female. The 13 month old male had received two doses of PedVaxHib (2 and 6 months), presented with meningitis and cellulitis, and resulted in death. The overall Hib rate for 2003 was 0.3/100,000 persons per year; for children less than 2 years, the rate was 4.9/100,000.

Antibiotic Resistance

The 18 *Haemophilus influenzae* isolates received at AIP were tested for susceptibility to chloramphenicol, ceftriaxone and TMP/sulfa. All 18 isolates were susceptible to chloramphenicol and ceftriaxone; 4 isolates showed intermediate resistance to TMP/sulfa, the remaining 14 were susceptible.

Table 13: Summary of Invasive *Haemophilus influenzae* Case Characteristics, Alaska, 2003

Sex	Age (Yrs)	Race	Anchorage /Other	Site of Isolation	Clinical Presentation(s)	Serotype*	Associated Medical Conditions	Outcome
M	0.4	AK Native	Other	Blood	Septicemia	a	None	
F	0.5	AK Native	Other	Blood	Pneumonia	a	Chronic lung disease	
M	0.7	AK Native	Other	Joint fluid	Septic arthritis, cellulitis	a	None	
F	0.9	AK Native	Other	Blood	Meningitis, pneumonia	a	Chronic lung disease	
M	1	AK Native	Other	Blood	Septic arthritis	a	Chronic lung disease	
M	1.1	AK Native	Other	Blood	Meningitis, cellulitis	b	Chronic lung disease	Death
M	3	AK Native	Other	Blood	Pneumonia	d	None	
M	31.7	Non-Native	Anchorage	Blood	Pneumonia	a	Chronic lung disease	
F	47.8	Non-Native	Anchorage	Blood	Pneumonia	NT	Cigarette smoking, injection drug use	
F	47.8	AK Native	Anchorage	Blood	Empyema, pneumonia	b	Cigarette smoking, alcohol abuse, diabetes	
F	58.8	AK Native	Other	Blood	Pneumonia	NT	Immune suppressive treatment	
M	66.7	Non-Native	Anchorage	Blood	Pneumonia	f	Chronic lung disease, immune suppressive treatment	Death
M	66.9	Non-Native	Anchorage	Blood	Septicemia	NT	Cigarette smoking, diabetes	Death
F	68.5	AK Native	Other	Blood	Septicemia	NT	None	
F	69.5	Non-Native	Anchorage	Blood	Septicemia	NT	Diabetes	
M	76.5	AK Native	Anchorage	Blood	Septicemia	NT	None	
F	79.9	Non-Native	Other	Blood	Pneumonia	NT	Chronic lung disease	Death
M	82.6	Non-Native	Anchorage	Blood	Septicemia	c	None	

*NT = non-typeable

Invasive *Neisseria meningitidis*

Overall Incidence

A total of 4 cases of invasive *Neisseria meningitidis* were reported to AIP in 2003 for an overall rate of 0.6/100,000. The Alaska rates are similar to the ABCs 2003 national projected rate of 0.5/100,000 (*Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network Neisseria meningitidis, 2003 - preliminary*). There was one invasive *N. meningitidis*-related death in Alaska in 2003 which resulted in a case fatality ratio of 25%.

Seasonality

N. meningitidis cases occurred one each in February, April, September and October; no clusters of related cases were reported.

Race

In 2001, 75% of invasive *N. meningitidis* cases in Alaska occurred in the non-Native population for an age-adjusted rate of 0.6/100,000 persons per year compared to the Alaska Native rate of 0.5/100,000 persons per year.

Table 14: Invasive *Neisseria meningitidis* Cases by Race – Alaska, 2003

Race	Cases n (%)	Age Adjusted Rate*	% Male	Deaths n (%)
Alaska Native	1 (25)	0.5	100	1 (100)
Non-Native	3 (75)	0.6	100	0 (0)
Total	4		100	1 (25)

*Cases per 100,000 per percent distribution of Alaska 2000 population

Region

Three of the four invasive *N. meningitidis* cases in 2003 occurred in Anchorage; the remaining case was in Southeast.

Age

Invasive *N. meningitidis* cases reported in 2003 ranged in age from 1.6 to 19 years old; the median age was 12.2 years. There were no cases of invasive *Neisseria meningitidis* in persons greater than 19 years old.

Clinical Presentation

The primary clinical presentation was determined by a review of the discharge diagnoses in each patient's individual medical record associated with the invasive bacterial illness. In cases with multiple discharge diagnoses, the most serious diagnosis related to the *N. meningitidis* infection

was recorded as the primary clinical presentation. Two cases presented with septicemia and two cases presented with meningitis.

N. meningitidis was isolated from blood samples in 3 of 4 (75%) cases in 2003. The remaining case was isolated from cerebrospinal fluid.

Mortality

There was one *N. meningitidis*-related death reported in Alaska in 2003. The case occurred in a 1.6 year old AK Native male who presented with meningitis. No risk factors were reported associated with this case.

Table 15: Summary of Invasive *Neisseria Meningitidis* Cases Characteristics, Alaska, 2003

Sex	Age (yrs)	Race	Anchorage /Other	Site of Isolation	Clinical Presentation(s)	Associated Medical Conditions	Outcome
M	1.6	AK Native	Other	Blood	Meningitis	None	Death
M	6.3	Non-Native	Anchorage	Blood	Septicemia	None	-
M	18	Non-Native	Anchorage	Blood	Septicemia	Cigarette smoking	-
M	19.3	Non-Native	Anchorage	CSF	Meningitis	Chronic lung disease	-

Invasive group A streptococcus

Overall Incidence

A total of 23 cases of invasive group A streptococcus (GAS) were reported to AIP in 2003. Overall rates of invasive GAS disease in the state of Alaska were 3.5/100,000 persons per year. The Alaska rate is similar to the ABCs 2003 national projected rate of 3.8/100,000 (*Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network group A streptococcus, 2003 - preliminary*). In 2003, there were 4 GAS-related deaths for a case fatality ratio of 17%.

Seasonality

Cases of group A streptococcus occurred throughout the year in 2003 with no apparent trends in seasonality.

Race

In 2003, 30% of invasive GAS cases in Alaska occurred in the Alaska Native population for an age-adjusted rate of 5/100,000 persons per year which was higher than the non-Native rate of 2.8/100,000 persons per year.

Table 16: Invasive group A streptococcus Cases by Race – Alaska, 2003

Race	Cases n (%)	Age Adjusted Rate*	% Male	Deaths n (%)
Alaska Native	7 (30)	5	43	1 (14)
Non-Native	16 (70)	2.8	81	3 (19)
Total	23		70	4 (17)

*Cases per 100,000 per percent distribution of Alaska 2000 population

Region

Sixteen (69.7%) of the 23 invasive group A streptococcus cases in 2003 were reported in Anchorage, 2 cases each in the YK Delta and Southeast and one case each in Bristol Bay, the Interior and the Arctic Slope regions.

Age

Invasive group A streptococcus cases reported in 2003 ranged in age from 0.9 to 73.8 years old; the median age was 46.3 years. Highest rates of disease occurred in children less than two years old (9.7/100,000 persons per year) and in the 55 - 64 year old age category (7.5/100,000 persons per year).

Figure 16: Invasive group A streptococcus by Age Group - Alaska, 2003

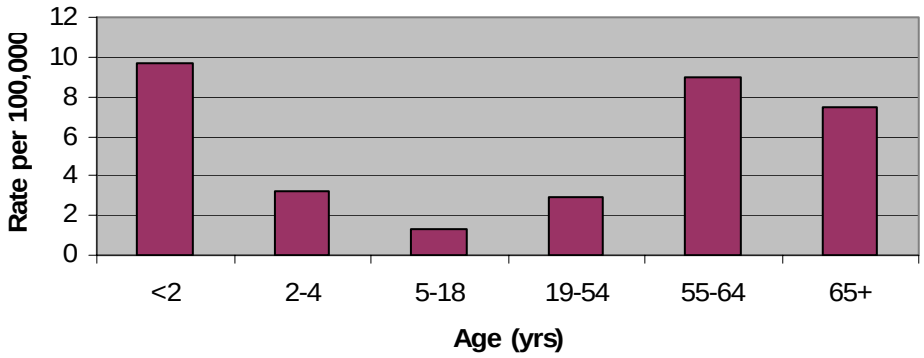
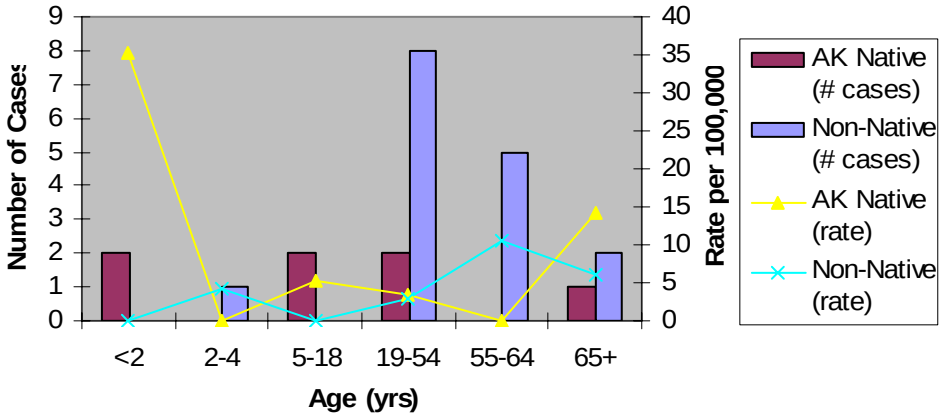


Figure 17: Invasive group A streptococcus, Cases & Rates by Age Group & Race - Alaska, 2003



In 2003, the highest rates of invasive group A streptococcal disease occurred in Alaska Natives less than 2 years old (35.2/100,000 persons per year) and Alaska Native adults 65 years of age and older (14.3/100,000 persons per year). The highest GAS disease rate in the non-Native population occurred in the 55-64 years age category (10.4/100,000 persons per year). No cases were reported in the AK Native population in the 2-4 and 55-64 age categories and no cases were reported in the non-Native population in the less than 2 and 5-18 age categories.

Clinical Presentation

The primary clinical presentation was determined by a review of the discharge diagnoses in each patient's individual medical record associated with the invasive bacterial illness. In cases with multiple discharge diagnoses, the most serious diagnosis related to the GAS infection was recorded as the primary clinical presentation. Table 17 shows the primary clinical presentations of invasive group A streptococcus in Alaska for 2003.

Group A streptococcus was isolated from blood samples in 20 (87%) of 23 cases and one each from tissue, pleural fluid and a tracheal aspirate.

Table 17: Primary Clinical Presentations of Invasive group A streptococcus – Alaska, 2003

Primary Presentation	n (%)
Cellulitis*	10 (44)
Septicemia	5 (22)
Pneumonia*	5 (22)
Empyema	1 (4)
Septic arthritis	1 (4)
Other	1 (4)
Total	23

*with bacteremia

Table 18: Summary of Invasive group A streptococcus Case Characteristics, Alaska, 2003

Sex	Age (yrs)	Race	Anchorage /Other	Site of Isolation	Clinical Presentation(s)	Associated Medical Conditions	Outcome
F	0.9	AK Native	Other	Blood	Pneumonia	Chronic lung disease	
M	1.7	AK Native	Anchorage	Pleural fluid	Empyema, pneumonia	Chronic lung disease	
M	4.6	Non-Native	Anchorage	Blood	Septicemia	None	
F	6.6	AK Native	Other	Tracheal aspirate	Pneumonia	None	
M	15.7	AK Native	Anchorage	Blood	Cellulitis	None	
M	22.3	AK Native	Anchorage	Tissue	Cellulitis, necrotizing fasciitis	Cigarette smoking, alcohol abuse	
F	24.4	AK Native	Other	Blood	Septic arthritis, cellulitis, necrotizing fasciitis	Cigarette smoking	
F	36.1	Non-Native	Anchorage	Blood	Cellulitis	Cigarette smoking, chronic lung disease	
M	39.8	Non-Native	Other	Blood	Cellulitis, necrotizing fasciitis	Cigarette smoking	Death
M	40.6	Non-Native	Anchorage	Blood	Septicemia	Immune suppressive treatment	
M	42.8	Non-Native	Other	Blood	Other	Alcohol abuse	
M	46.3	Non-Native	Anchorage	Blood	Cellulitis	Cigarette smoking	
F	48.6	Non-Native	Anchorage	Blood	Septicemia	Cigarette smoking, chronic lung disease, alcohol abuse	
F	53.2	Non-Native	Anchorage	Blood	Cellulitis	Cigarette smoking, injection drug use	
M	53.9	Non-Native	Anchorage	Blood	Cellulitis	Diabetes	
M	55.6	Non-Native	Anchorage	Blood	Cellulitis	Alcohol abuse, diabetes	
M	62.1	Non-Native	Anchorage	Blood	Septicemia	Cigarette smoking, alcohol abuse	
M	62.6	Non-Native	Anchorage	Blood	Pneumonia	Diabetes	
M	64.2	Non-Native	Anchorage	Blood	Cellulitis	Diabetes	
M	64.9	Non-Native	Other	Blood	Cellulitis, septicemia	None	Death
F	66	AK Native	Anchorage	Blood	Pneumonia	Chronic lung disease	Death
M	72.6	Non-Native	Other	Blood	Septicemia	Chronic lung disease, immune suppressive treatment	
M	73.8	Non-Native	Anchorage	Blood	Pneumonia	None	Death

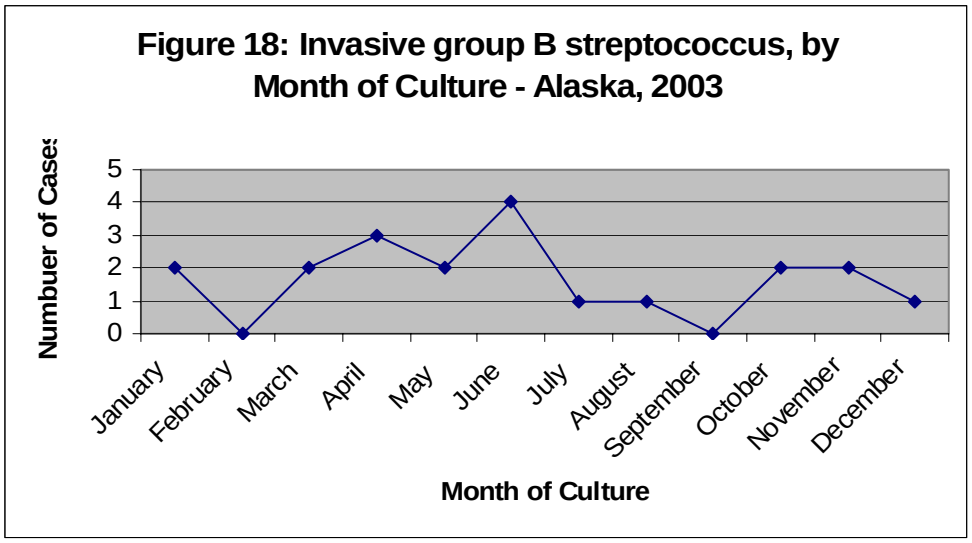
Invasive group B streptococcus

Overall Incidence

A total of 20 cases of invasive group B streptococcus (GBS) were reported to AIP in 2003. Overall rates of invasive GBS disease in the state of Alaska were 3.1/100,000 persons per year. The Alaska rate is lower than the ABCs 2003 national projected rate of 7.0/100,000 (*Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network group B streptococcus, 2003 - preliminary*). In 2003, there were two GBS-related deaths for a case fatality ratio of 12% (outcome was unknown in 3 cases).

Seasonality

Cases of group B streptococcus occurred throughout the year. The highest proportion (20%) of GBS cases occurred in the month of June.



Race

In 2003, 15% of invasive group B streptococcus cases in Alaska occurred in the Alaska Native population for an age-adjusted rate of 2.4/100,000 persons per year compared with the non-Native rate of 3.2/100,000 persons per year.

Table 19: Invasive group B streptococcus Cases by Race – Alaska, 2003

Race	Cases n (%)	Age Adjusted Rate*	% Male	Deaths n (%)†
Alaska Native	3 (15)	2.4	0	0 (0)
Non-Native	17 (85)	3.2	41	2 (13)
Total	20		35	2 (12)

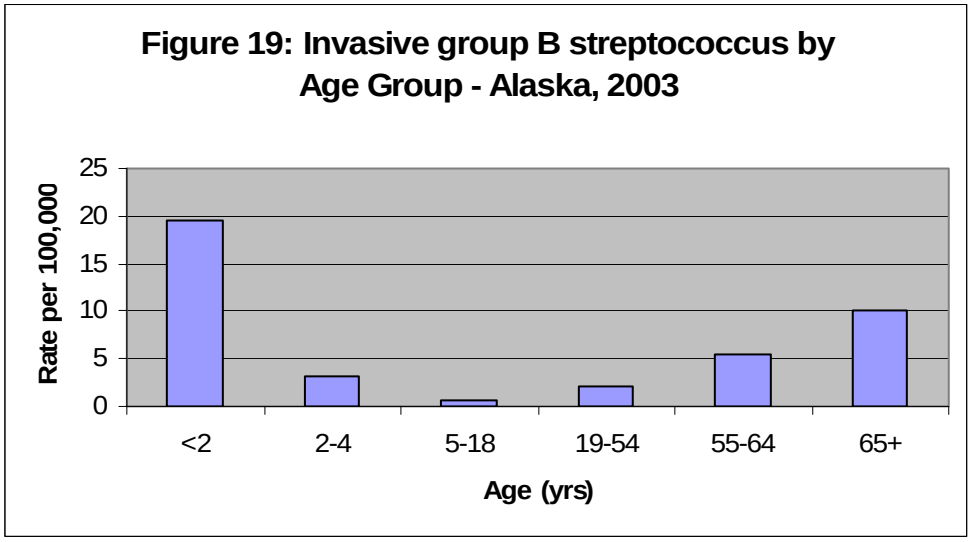
*Cases per 100,000 per percent distribution of Alaska 2000 population
†Outcome unknown in 1 AK Native case, 2 non-Native cases

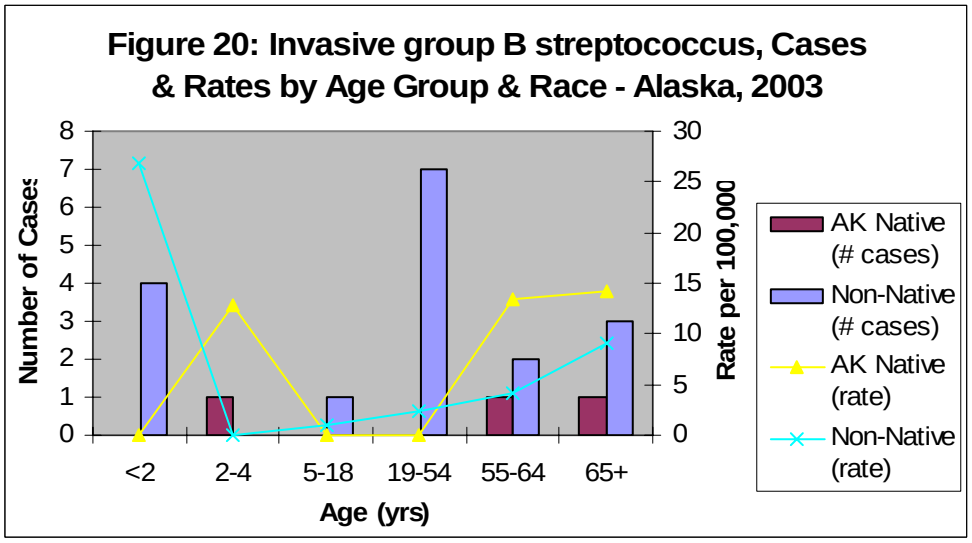
Region

In 2003, 15 of the 20 reported GBS cases occurred in Anchorage; three cases were reported in Southeast Alaska and two in the Interior.

Age

Invasive group B streptococcus cases reported in 2003 ranged in age from newborn to 90.2 years old; the median age was 49.7 years. Highest rates of disease occurred in children less than two years old (19.5/100,000 persons per year) and in the 65 and older age category (10/100,000 person per year).





Rates of GBS disease in Alaska Native versus non-Native populations by age group were highly variable. The highest rates of disease occurred in non-Native children less than 2 years of age

(26.9/100,000 persons per year). The four cases that occurred in this age category were early-onset disease (cases were less than 7 days old); and comprised a rate of 56.7/100,000 persons per year. There were no cases of invasive GBS in children less than 2 years old in Alaska Natives.

Clinical Presentation

The primary clinical presentation was determined by a review of the discharge diagnoses in each patient's individual medical record associated with the invasive bacterial illness. In cases with multiple discharge diagnoses, the most serious diagnosis related to the GBS infection was recorded as the primary clinical presentation. In 2003, the most common clinical presentation was septicemia which occurred in 8 cases (40%). Two cases of septic arthritis had additional presentations of osteomyelitis, one case had a third presentation of cellulitis.

Group B streptococcus was isolated from blood in 19 (95%) of 20 cases in 2003; one case was isolated from an unspecified sterile site.

Table 20: Primary Clinical Presentations of Invasive group B streptococcus – Alaska, 2003

Primary Presentation	n (%)
Septicemia	8 (40)
Cellulitis*	3 (15)
Pneumonia*	3 (15)
Bacteremia	2 (10)
Septic arthritis	2 (10)
Meningitis	1 (5)
Total	20

*with bacteremia

Table 21: Summary of Invasive group B streptococcus Case Characteristics, Alaska, 2003

Sex	Age (yrs)	Race	Anchorage /Other	Site of Isolation	Clinical Presentation(s)	Associated Medical Conditions	Outcome
F	< 1 day	Non-Native	Anchorage	Blood	Septicemia	None	
M	< 1 day	Non-Native	Anchorage	Blood	Pneumonia	None	
M	< 1 day	Non-Native	Other	Blood	Septicemia	None	Death
F	< 1 day	Non-Native	Anchorage	Blood	Meningitis	None	
F	2.9	AK Native	Other	Blood	Pneumonia	Chronic lung disease	Unknown
M	12.5	Non-Native	Anchorage	Blood	Pneumonia	None	
F	20.2	Non-Native	Anchorage	Blood	Cellulitis, osteomyelitis	Diabetes	
F	33.6	Non-Native	Anchorage	Blood	Septicemia	None	
M	47.5	Non-Native	Anchorage	Blood	Septic arthritis, osteomyelitis	Cigarette smoking, diabetes, injection drug use	
F	49.1	Non-Native	Anchorage	Blood	Septicemia	Chronic lung disease, diabetes	
F	50.2	Non-Native	Anchorage	Blood	Bacteremia	Chronic lung disease, diabetes	Unknown
F	50.5	Non-Native	Other	Blood	Peritonitis	Chronic lung disease, alcohol abuse	Unknown
M	54	Non-Native	Other	Other	Cellulitis	Immune suppressive treatment, diabetes	
F	56.4	AK Native	Other	Blood	Septicemia	Diabetes	
M	61.9	Non-Native	Anchorage	Blood	Septicemia	Cigarette smoking, chronic lung disease, diabetes	
F	63.5	Non-Native	Anchorage	Blood	Septic arthritis, cellulitis, osteomyelitis	None	
M	66.9	Non-Native	Anchorage	Blood	Septicemia	Cigarette smoking, diabetes	Death
F	79.5	Non-Native	Anchorage	Blood	Septicemia	None	
F	81.1	AK Native	Anchorage	Blood	Bacteremia	Alcohol abuse	
F	90.2	Non-Native	Anchorage	Blood	Cellulitis	None	

Appendix

MIC Interpretive Standards Definitions:

NCCLS provides recommended interpretive categories for various Minimum Inhibitory Concentration values (cut points) for each organism which are defined as follows:*

1. Susceptible (S):

The "susceptible" category implies that an infection due to the strain may be appropriately treated with the dosage of antimicrobial agent recommended for that type of infection and infecting species, unless otherwise contraindicated.

2. Intermediate (I):

The "intermediate" category includes isolates with antimicrobial agent MICs that approach usually attainable blood and tissue levels and for which response rates may be lower than for susceptible isolates. The "intermediate" category implies clinical applicability in body sites where the drugs are physiologically concentrated (e.g., quinolones and β-lactams in urine) or when a high dosage of a drug can be used (e.g., β-lactams). The "intermediate" category also includes a buffer zone which should prevent small, uncontrolled technical factors from causing major discrepancies in interpretations, especially for drugs with a narrow pharmacotoxicity margins.

3. Resistant (R):

Resistant strains are not inhibited by the usually achievable systemic concentrations of the agent with normal dosage schedules and/or fall in the range where specific microbial resistance mechanisms are likely (e.g., β-lactamases) and clinical efficacy has not been reliable in treatment studies.

* NCCLS, MIC Testing, Supplemental Tables, M100-S10 (M&), January 2000, p.9.