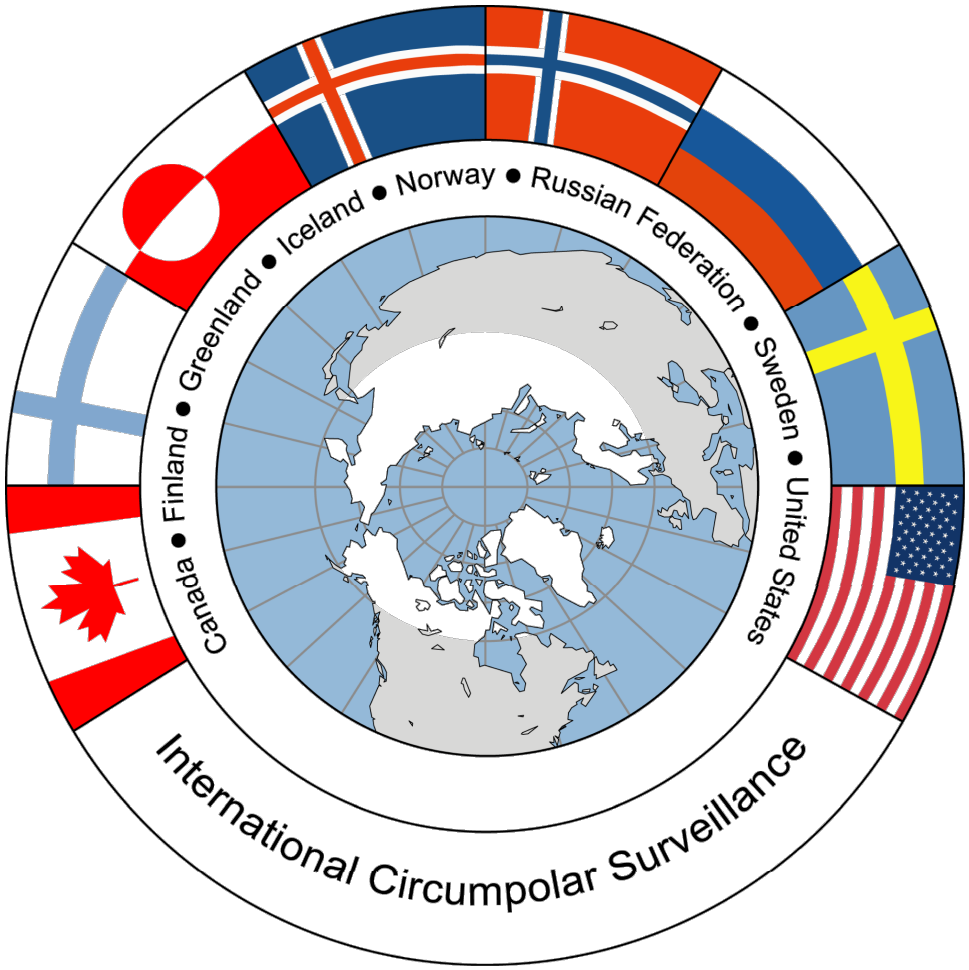
INTERNATIONAL CIRCUMPOLAR SURVEILLANCE (ICS) SUMMARY REPORT



YEAR 2004 DATA

TABLE OF CONTENTS

SUMMARY

International Circumpolar Surveillance (ICS) is a population-based surveillance system for invasive bacterial diseases established in the U.S. Arctic, Northern Canada, Greenland, Iceland, Norway, Finland, and Northern Sweden. Data collection began in 1999 and includes information on disease caused by *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Neisseria meningitidis*, and groups A and B S*treptococcus* (GAS, GBS). This report reviews the data collected for the year 2004.

Data on invasive disease with the organism *S. pneumoniae* are collected from all participating countries. A total of 2,039 cases of invasive pneumococcal disease were identified in 2004. Overall, rates of invasive *S. pneumoniae* were highest in individuals less than 2 years of age, however, the median age of cases was greater than 40 years in all countries. Case fatality ratios ranged from 6-16.5%. Race and ethnicity data are collected only in N. Canada and the U.S. Arctic; rates of invasive pneumococcal disease in Northern Canadian Aboriginals and U.S. Arctic Native populations were 30 and 37 cases per 100,000 population, respectively, which represents an increase in disease from 2003 in Northern Canadian Aboriginals and an decrease in disease in U.S. Arctic Natives. Pneumonia and bacteremia were the most common clinical presentations; cigarette smoking was the most common risk factor. The most common *S. pneumoniae* serotype in Finland is 14; in Iceland the most common serotype is 7F, in the U.S. Arctic the most common serotype is 19A; and in Greenland and N. Canada the most common serotype is 1.

Data on invasive disease due to *H. influenzae*, *N. meningitidis*, and groups A and B *Streptococcus* are currently collected in Greenland, Northern Canada, Northern Sweden and the U.S. Arctic. A total of 25 *H. influenzae* cases, 5 *N. meningitidis* cases, 41 GAS cases, and 48 GBS cases were reported in 2004. In general, the highest rates of disease as a result of all organisms occurred in N. Canada Aboriginal or Alaska Native persons less than two years of age.

Surveillance Organisms Reported by Country, ICS 2004 Data

Country	*S. pneumoniae* n (rate*)	*H. influenzae* n (rate*)	*N. meningitidis* n (rate*)	GAS n (rate*)	GBS n (rate*)
Finland	746 (14.2)	N/A	N/A	N/A	N/A
Greenland	13 (22.9)	0 (0)	0 (0)	0 (0)	0 (0)
Iceland	53 (18.1)	N/A	N/A	N/A	N/A
N. Canada	33 (24.8)	11 (8.3)	0 (0)	10 (7.5)	2 (1.5)
N. Sweden	38 (15)	2 (0.8)	0 (0)	5 (2)	12 (4.8)
Norway	1,056 (23.1)	N/A	N/A	N/A	N/A
U.S. Arctic	100 (15.3)	12 (1.8)	5 (0.8)	26 (4)	34 (5.2)
Total	2,039 (18.2)	25 (2.3)	5 (0.5)	41 (3.7)	48 (4.4)

*Cases per 100,000

INTRODUCTION

In January, 1999, the United States and Canada began international cooperative population-based surveillance for invasive *S. pneumoniae* by all laboratories serving residents of the North American Arctic. In January, 2000, this surveillance system expanded to include invasive diseases with the following organisms: *H. influenzae* (all types), *N. meningitidis*, GAS, and GBS. These pathogens were selected for ICS because rates of these diseases are elevated in indigenous peoples of the north, strains demonstrate resistance to commonly used antibiotics, they are routinely cultured in clinical laboratories, and clinically important serotypes of *S. pneumoniae*, *H. influenzae*, and *N. meningitidis* are vaccine preventable in infants and adults.

Denmark's autonomous region of Greenland joined ICS in 2000; Iceland, Norway (including Svalbard), and Finland joined in 2001; and Northern Sweden joined in 2003. This report contains year 2004 data on all five surveillance organisms from Greenland, Northern Canada, Northern Sweden, and the U.S. Arctic, and *S. pneumoniae* data from Finland, Iceland, and Norway.

GOALS

The goal of ICS is to establish an integrated network of hospital and public health facilities throughout the Arctic countries to monitor infectious diseases of concern. Linking public health facilities within Arctic nations will allow for the collection and sharing of uniform laboratory and epidemiological data that will describe the prevalence of infectious diseases in Arctic populations and assist in the formulation of prevention and control strategies.

The project, initiated in 1998, focused on establishing an ICS system for diseases caused by *S. pneumoniae*. This bacterium causes pneumonia, meningitis, and bacteremia in both the very young and the elderly. Once easily treated with antibiotics, this bacterium is now becoming resistant to commonly used antibiotics. This is of great concern to the public health community and is increasingly a target for surveillance by many countries worldwide. A polysaccharide vaccine is available for use in persons two years of age and older. A conjugate vaccine for infants has been developed and is licensed for use in the U.S., Canada, and the European Union. The fact that diseases caused by *S. pneumoniae* are already being monitored by many public health authorities within the Arctic states makes establishing a circumpolar surveillance system for this infection feasible. In addition, due to the availability of polysaccharide and conjugate vaccines, much of the morbidity and mortality caused by *S. pneumoniae* is currently preventable.

ICS objectives include:

- Identify key public health contacts within Arctic countries. These persons should be familiar with infectious disease surveillance systems in place (particularly surveillance systems for diseases caused by *S. pneumoniae*) in the member country. Through correspondence and working group meetings, the scope and gaps of the surveillance systems are determined.

- Determine the comparability of laboratory and data collection methods, and negotiate standard protocols and quality control programs.

- Share and report data in agreed upon formats.

- Form a working group of key laboratory and public health contacts to coordinate pneumococcal surveillance within their respective jurisdictions. This group meets on a regular basis to review problems, progress, compliance, report generation, and future plans.

- Form a steering committee of national Arctic health experts to coordinate new objectives and initiatives within ICS.

This program forms a framework through which surveillance of other infectious diseases as well as prevention and control programs can be added. Other infectious diseases of circumpolar community concern include: other invasive bacterial diseases (caused by *H. influenzae*, *N. meningitidis*, GAS, and GBS), tuberculosis, HIV, hepatitis, foodborne diseases (botulism, brucellosis), waterborne diseases, respiratory diseases of children such as those caused by respiratory syncytial virus, and chronic conditions related to infectious agents (hepatitis B virus and liver cancer, human papilloma virus and cervical cancer). In addition, the surveillance model developed by this program for infectious disease may be adapted to monitor other non-infectious human health priorities of community concern.

METHODS

ICS is coordinated by personnel at the Arctic Investigations Program, Centers for Disease Control and Prevention, in Anchorage, Alaska.

A case of invasive *S. pneumoniae*, *H. influenzae*, *N. meningitidis*, GAS or GBS is defined by the isolation 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 the surveillance area.

In the U.S. Arctic and Northern Canada, laboratory, demographic and clinical data are collected continually by ICS, while in Greenland, Iceland, Northern Sweden, Norway, and Finland, summary data are submitted to ICS in aggregate at the end of the year.

Surveillance System Description by Country/Region

The following table outlines the organisms reported and data provided by each country or region.

Data Provided by Country/Region, ICS 2004

Country	*S. pneumoniae*	*H. influenzae*	*N. meningitidis*	GAS	GBS	Serotype	Demographics	Race/Ethnicity	Risk Factors	Outcome
Finland	X					X	X			
Greenland	X	X	X	X	X	X	X			X
Iceland	X					X	X			X
N. Canada	X	X	X	X	X	X	X	X	X	X
N. Sweden	X	X					X			
Norway	X						X			X
U.S. Arctic	X	X	X	X	X	X	X	X	X	X

Finland

- 23 district hospital laboratories participate in ICS.
  - Provide diagnostic microbiology services for all residents of Finland.
  - All invasive isolates of *S. pneumoniae* submitted to the National Public Health Institute (KTL) laboratory in Oulu.

- Antimicrobial susceptibility testing of *S. pneumoniae* isolates was performed by agar dilution method at district hospital laboratories as well as the KTL laboratory.

- Serotyping is performed at the KTL laboratory by counter-immune-electrophoresis.

- Population estimates for 2004 were obtained from the website http://www.stat.fi

Greenland

- 15 district hospital laboratories participate in ICS.
  - Provide diagnostic microbiology services for all residents of Greenland.
  - All invasive isolates of *S. pneumoniae*, *H. influenzae*, *N. meningitidis*, GAS, and GBS submitted to reference laboratories in Nuuk and Copenhagen.

- Antimicrobial susceptibility testing of *S. pneumoniae* isolates was performed by agar dilution at the central laboratory at Queen Ingrid's Hospital in Nuuk.

- Serotyping was performed at the Statens Serum Institute in Copenhagen, Denmark, by the Quellung method.

- Clinical and demographic data for every case of invasive *S. pneumoniae*, *H. influenzae*, *N. meningitidis*, GAS, and GBS was collected by public health authorities at the end of the year and entered onto a standardized collection tool, the Bacterial Diseases Surveillance Form (BDSF), which is also used in Iceland, Northern Canada, and the U.S. Arctic.

- Population estimates for 2004 were obtained from the website http://www.statgreen.gl

Iceland

- 10 district hospital laboratories and one regional laboratory participate in ICS.
  - Provide diagnostic microbiology services for all residents of Iceland.
  - All invasive isolates of *S. pneumoniae* submitted to the reference hospital in Reykjavik.

- Antimicrobial susceptibility testing of *S. pneumoniae* isolates is performed by disc diffusion method at the Landspitali University Hospital (LUH) in Reykjavik and the laboratory at the regional hospital in Akureyri. All oxacillin resistant isolates are then analyzed by E test.

- Serotyping is performed at the LUH by coagglutination using antisera from Statens Serum Institute.

- Clinical and demographic data for every case of invasive *S. pneumoniae* was collected by public health authorities at the end of the year and entered onto the same collection form (BDSF) used in Greenland, Northern Canada, and the U.S. Arctic.

- Population estimates for 2004 were obtained form the website http://www.hagstofa.is

Northern Canada

- 14 Canadian laboratories participate in ICS.
  - Provide diagnostic microbiology services for all residents of the Yukon Territory, Northwest Territories, Nunavut, Northern Quebec, and Northern Laborador.
  - Submit all invasive isolates of *S. pneumoniae*, *H. influenzae*, *N. meningitidis*, GAS, and GBS to one of two reference laboratories in Canada.
  - *S. pneumoniae*, *H. influenzae*, GAS, and GBS isolates are serotyped by the Quellung method using Statens Serum Institute antisera.

- Antimicrobial susceptibility of *S. pneumoniae*, GAS, and GBS isolates was tested by micro-broth dilution (according to NCCLS recommendations).

- Communicable disease consultants located within one of the five regions of Northern Canada provided clinical and demographic information on the same collection form (BDSF) used in Greenland, Iceland, and the U.S. Arctic.

- Laboratory and clinical data are forwarded to the ICS coordinator at AIP in Anchorage.

- Population estimates for 2004 were obtained from the website http://www.statcan.ca

Northern Sweden

- 1 district laboratory participates in ICS.
  - Provides diagnostic microbiology services for all residents of Norrbotten County
  - The main reference laboratory is at the Swedish Institute for Infectious Disease Control in Stockholm.
  - Isolates are serotyped by the Quellung method.

- Antimicrobial susceptibility testing was by disc diffusion at the University Hospital in Umea and Sunderby Hospital in Lulea.

- Population estimates for 2004 were obtained from the website http://www.scb.se/default____2154.asp

Norway

- 33 district hospital laboratories participate in ICS.
  - Provide diagnostic microbiology services for all residents of Norway.
  - All invasive isolates of *S. pneumoniae* submitted to one of two reference laboratories in Oslo or Tromso.

- Antimicrobial susceptibility testing of *S. pneumoniae* isolates is performed using the disc diffusion method at district hospital laboratories, the reference laboratory in Tromso or the main national laboratory in Oslo.

- Serotyping is performed at the Statens Serum Institute in Denmark by the Quellung method.

- Population estimates for 2004 were obtained from the website http://www.ssb.no

U.S. Arctic

- Population-based surveillance in the state of Alaska
  - Since 1980 for invasive *H. influenzae*.
  - Since 1986 for invasive *S. pneumoniae*.
  - Since 1999 for invasive diseases caused by *N. meningitidis*, GAS, and GBS.
  - Coordinated by the Arctic Investigations Program (AIP), National Center for Infectious Disease, Centers for Disease Control and Prevention, in Anchorage, Alaska.

- 23 laboratories providing diagnostic services to residents of Alaska submitted to AIP isolates of *S. pneumoniae*, *H. influenzae*, *N. meningitidis*, GAS, and GBS cultured in blood, cerebrospinal fluid, or from other sterile sites.
  - *S. pneumoniae* and *H. influenzae* isolates are serotyped by the Quellung method using Statens Serum Institute antisera.
  - Serogroup testing of *N. meningitidis* isolates from Alaska is performed at the Canadian National Centre for Meningococcal Disease in the CNS Infections Laboratory in Winnipeg.
    - By the slide agglutination method using specific antisera.
    - By PCR detection of the siaDgene responsible for synthesis of the serogroup-specific polysialytransferase.

- Antimicrobial susceptibility testing of *S. pneumoniae* isolates is performed at AIP by micro-broth dilution (according to NCCLS recommendations).

- Clinical and demographic information on each case-patient is recorded by AIP research nurses onto the same collection form (BDSF) used in Greenland, Iceland, and Northern Canada.

- Population estimates for 2004 were obtained from the website http://www.labor.state.ak.us

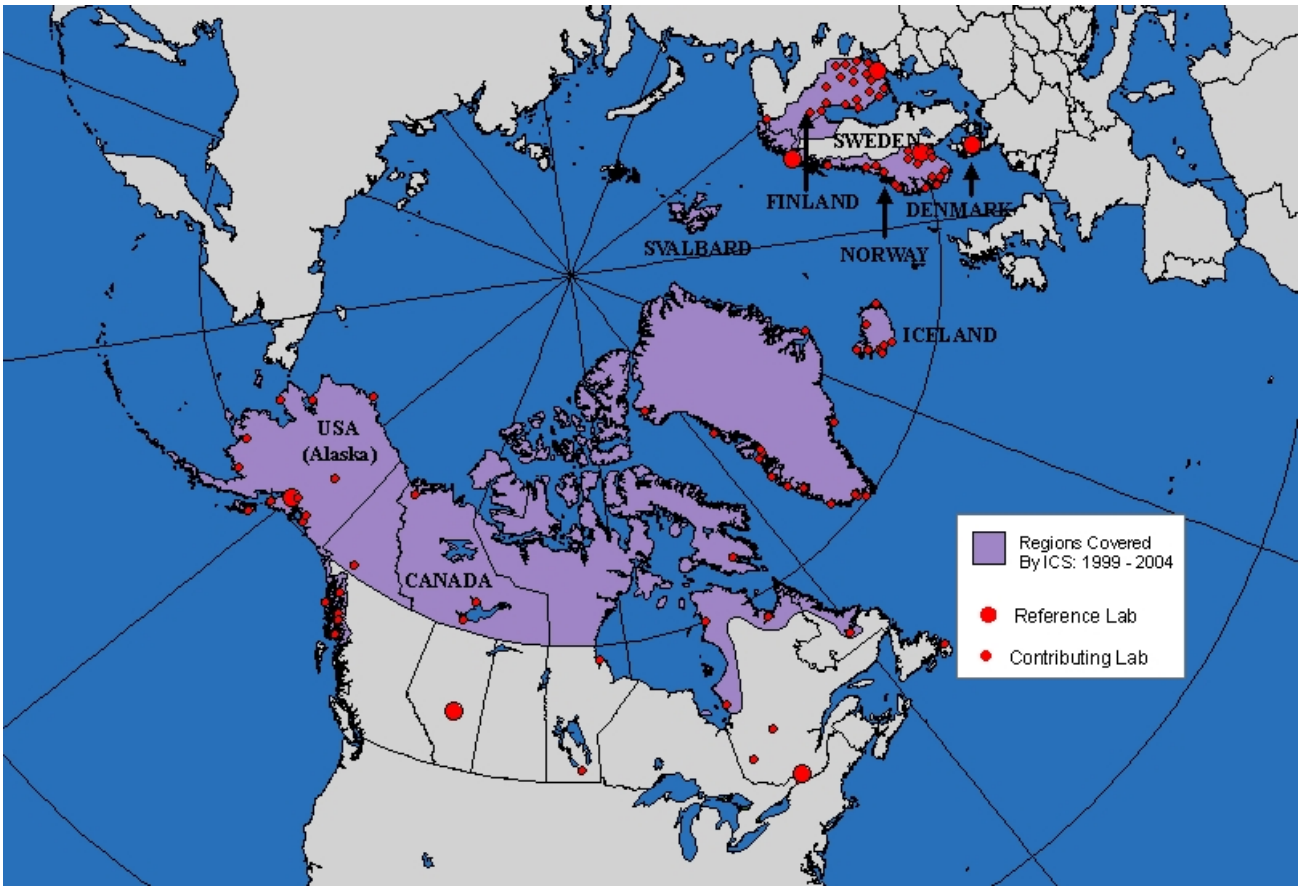
Quality Control

Currently 37 clinical laboratories in the U.S. Arctic and N. Canada forward isolates from patients with invasive pneumococcal disease to reference laboratories in Alaska and Canada respectively. To ensure inter-laboratory comparability of *S. pneumoniae* serotyping and antimicrobial susceptibility testing between two reference laboratories in Canada (Alberta and Quebec) and one in the U.S. (Alaska), the ICS *S. pneumoniae* inter-laboratory quality control (QC) program was established in 1999. Statens Serum Institute, Copenhagen, Denmark, joined the program in 2004.

Each reference laboratory is responsible for exporting one QC panel of seven *S. pneumoniae* isolates each year to each of the other laboratories using a transportation medium of their choice for a total of

28 *Strep pneumoniae* isolates in 2004. Serotyping was performed by Quellung reaction. Minimum inhibitory concentration (MIC) is determined for each QC isolate and for ATCC strain 49619 for those antibiotics which are routinely tested in each laboratory. MIC results for each laboratory are expected to be within one $\log_2$ dilution of each other regardless of testing method. Discrepancies of results are documented and examined to determine causes and solutions.

Participating Countries, ICS 2004



RESULTS

Streptococcus pneumoniae

Case Demographics

A total of 2,039 cases of invasive disease caused by *S. pneumoniae* were reported to ICS during 2004 by Finland, Greenland, Iceland, N. Canada, N. Sweden, Norway, and the U.S. Arctic. The highest rates of disease (24.8 per 100,000) occurred in N. Canada and the lowest in Finland (14.2 per 100,000) with an overall rate for the ICS circumpolar region of 18.2 per 100,000; 54% of all cases occurred in males. The median age of cases overall was 59 years with the lowest median age in N. Canada (45 years) and the highest in N. Sweden (72 years). Case fatality ratios ranged from 6% in N. Canada and Norway to 16.5% in the U.S. Arctic; the overall case fatality ratio was 7%.

***Streptococcus pneumoniae* Case Demographics, ICS 2004 Data**

Country	Population	# Cases	Rate*	Sex M (%)	Median Age (min-max) yrs	Deaths n (CFR†)
Finland	5,236,611	746	14.2	432 (58)	54 (0-100)	‡
Greenland	56,854	13	22.9	8 (62)	47 (0-59)	2 (15)
Iceland	292,587	53	18.1	26 (49)	64 (0.5-98)	6 (11)
N. Canada	132,956	33	24.8	24 (73)	45 (0.2-83)	2 (6)
N. Sweden	252,585	38	15	17 (45)	72 (1.5-99)	‡
Norway	4,577,457	1,056	23.1	541 (51)	63 (0-99)	60 (6)
U.S. Arctic	655,435	100	15.3	48 (48)	46 (0.2-98)	16 (16.5) [a]
Total	11,204,485	2,039	18.2	1,096 (54)	59 (0-100)	86 (7)

*Number of cases per 100,000 per year
†Case fatality ratio
‡Case outcomes not reported from Finland, N. Sweden
[a]Case outcomes unknown in 3 cases from U.S. Arctic

***Streptococcus pneumoniae* by Age Category, ICS 2004 Data**

Age		Finland	Greenland	Iceland	N. Canada	N. Sweden	Norway	U.S. Arctic
<2 yrs	Pop	114,393	1,729	8,364	4,849	4,816	112,858	20,900
	N (%)	70 (9)	1 (8)	10 (19)	3 (9)	1 (3)	67 (6)	18 (18)
	Rate*	61.2	57.8	119.6	61.9	20.8	59.4	86.1
2-19 yrs	Pop	1,118,272	17,073	78,375	44,845	53,833	1,077,498	193,315
	N (%)	60 (8)	0 (0)	2 (4)	3 (9)	0 (0)	57 (5)	9 (9)
	Rate*	5.4	0	2.6	6.7	0	5.3	4.7
20-64 yrs	Pop	3,173,006	34,928	717,559	77,823	146,250	2,712,742	399,638
	N (%)	378 (51)	12 (92)	17 (32)	25 (76)	14 (37)	436 (41)	53 (53)
	Rate*	11.9	34.4	2.4	32.1	9.6	16.1	13.3
65+ yrs	Pop	830,940	3,124	34,289	5,439	47,686	674,359	41,582
	N (%)	238 (32)	0 (0)	24 (45)	2 (6)	23 (61)	496 (47)	20 (20)
	Rate*	28.6	0	70	36.8	48.2	73.6	48.1
All ages	Pop	5,236,611	56,854	292,587	132,956	252,585	4,577,457	655,435
	N	746	13	53	33	38	1,056	100
	Rate*	14.2	22.9	18.1	24.8	15	23.1	15.3

*Number of cases per 100,000 per year

When stratified by age, the highest rates of disease in all countries occurred in those cases less than two years of age and in cases 65+ years of age, with the exception of Greenland, where no cases were reported in individuals 65+ years of age.

Seasonality

S. pneumoniae was diagnosed throughout the year in 2004 in each country. For four countries (Finland, N. Sweden, Norway, U.S. Arctic), higher proportions of disease were seen in the first and fourth quarters of the year with the smallest proportion during the third quarter. In Iceland and N. Canada, the pattern was reversed with the highest proportion of disease in the third quarter and lowest in the first and fourth quarters. In Greenland, the highest proportion of disease was in the first quarter of the year and the lowest in the fourth quarter.

Race

Race and ethnicity data were collected in N. Canada and the U.S. Arctic. Rates of invasive pneumococcal disease were higher in Aboriginal and Native populations than in non-Aboriginal and non-Native populations with the exception of non-Aboriginals 2-19 and 65+ years in N. Canada. The highest rates of disease occurred in Aboriginal and Native populations less than 2 years of age in both countries.

***Streptococcus pneumoniae* by Race and Age Categories, ICS 2004 Data**

Age (yrs)		N. Canada*		U.S. Arctic†	
		Aboriginal	**Non-Aboriginal**	**Native**	**Non-Native**
<2	Population	3,597	1,252	5,993	14,907
	Cases (rate‡)	3 (83.4)	0 (0)	13 (216.9)	4 (26.8)
2-19	Population	31,840	13,005	48,236	145,079
	Cases (rate‡)	2 (6.3)	1 (7.7)	4 (8.3)	5 (3.4)
20-64	Population	37,377	40,446	65,644	333,994
	Cases (rate‡)	17 (45.5)	4 (9.9)	25 (38.1)	28 (8.4)
65+	Population	3,036	2,403	7,135	34,447
	Cases (rate‡)	1 (32.9)	1 (41.6)	5 (70.1)	14 (40.6)
All Ages	Population	75,850	57,106	127,008	528,427
	Cases (rate‡)	23 (30.3)	6 (10.5)	47 (37)	51 (9.7)

*Race unknown in 4 cases 20-64 years
†Race unknown in 1 case <2 years, 1 case 65+ years
‡Number of cases per 100,000 per year

Clinical Presentation

The most common clinical presentations associated with *S. pneumoniae* were pneumonia, bacteremia or septicemia, and meningitis. Clinical diagnoses other than bacteremia and meningitis are not reported in the Finland and N. Sweden *S. pneumoniae* data. In Greenland, N. Canada, Norway, and the U.S. Arctic the clinical presentation reported most often was pneumonia (100%, 61%, 42% and 61%, respectively); in Finland, Iceland and N. Sweden it was bacteremia (95%, 87% and 95%, respectively).

Clinical Presentation of Reported *Streptococcus pneumoniae* Cases, ICS 2004 Data

	Finland n (%)	Greenland n (%)	Iceland n (%)	N Canada n (%)	N Sweden n (%)	Norway n (%)	US Arctic n (%)
Pneumonia*	0 (0)	13 (100)	0 (0)	20 (61)	0 (0)	445 (42)	61 (61)
Septicemia	0 (0)	0 (0)	0 (0)	5 (15)	0 (0)	204 (19)	22 (22)
Bacteremia	711 (95)	0 (0)	46 (87)	0 (0)	36 (95)	152 (14)	1 (1)
Meningitis	35 (5)	0 (0)	4 (8)	3 (9)	2 (5)	85 (8)	8 (8)
Empyema	0 (0)	0 (0)	0 (0)	3 (9)	0 (0)	0 (0)	3 (3)
Cellulitis*	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
Septic arthritis	0 (0)	0 (0)	3 (6)	1 (3)	0 (0)	3 (<1)	1 (1)
Peritonitis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (2)
Epiglottitis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (<1)	0 (0)
Osteomyelitis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
Amnionitis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (<1)	0 (0)
Appendicitis	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)	0 (0)	0 (0)
Other	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	166 (16)	1 (1)
Total Cases	746	13	53	33	38	1,056	100

*with bacteremia

Risk Factors

N. Canada and the U.S. Arctic report medical conditions or risk factors associated with *S. pneumoniae*. In adults 18 years and older, cigarette smoking and alcohol abuse were the most common associated conditions occurring in 39 to 44% of patients.

***Streptococcus pneumoniae* Risk Factor/Medical Conditions in Adults*, ICS 2004 Data**

	N. Canada n (%)	U.S. Arctic n (%)
Cigarette Smoking	11 (41)	32 (43)
Alcohol Abuse	12 (44)	29 (39)
Chronic Lung Disease and/or Asthma	2 (7)	18 (24)
Immunosuppressive Therapy	0 (0)	5 (7)
Diabetes	5 (19)	12 (16)
Injection Drug Use	1 (4)	4 (5)
Asplenia	1 (4)	3 (4)
Total Adult* Cases	27	74

*≥ 18 years

Vaccination Policy

In Finland, Iceland, N. Canada, Norway, and the U.S. Arctic, 23-valent pneumococcal polysaccharide vaccine (PS23) is recommended for persons 55 years and older (U.S. Arctic), over 60 years (Iceland) or over 65 years of age (Finland, N. Canada, Norway), and to persons greater than two years of age (Finland, Iceland, Norway, U.S. Arctic) or greater than five years of age (N. Canada) with specific medical problems. The vaccine is only recommended for certain risk groups in N. Sweden. The pneumococcal 7-valent conjugate vaccine (PCV7) was introduced into the infant immunization schedule in the U.S. Arctic in January, 2001.

Vaccination Status

One hundred percent of *S. pneumoniae* cases in children less than 2 years of age with known vaccination status were vaccinated with PCV7 in N. Canada and the U.S. Arctic, respectively. Only 3% of cases eligible for PS23 in Norway were vaccinated indicating much less frequent use of this vaccine than in N. Canada and the U.S. Arctic. Vaccine coverage data was not reported from Finland and Iceland.

***Streptococcus pneumoniae* Case Vaccination Status for Pneumococcal Vaccine, ICS 2004 Data**

	N. Canada	Norway	U.S. Arctic
Total cases eligible for PCV7 vaccine*	3	[a]	18
Vaccine status known in cases eligible for PCV7	3	[a]	16
Cases eligible for PCV7 vaccinated (%)†	3 (100)	[a]	16 (100)
Total cases eligible for PS23 vaccine‡	2	496	33
Vaccine status known in cases eligible for PS23	2	218	17
Cases eligible for PS23 vaccinated (%)†	2 (100)	6 (3)	12 (71)

*Children less than 2 years of age
†Percent of vaccine status known cases
‡Adults 55 years and older in the U.S. Arctic, 65 years and older in N. Canada and Norway
[a]PCV7 is not used routinely in Norway

Serotypes

The most prevalent *S. pneumoniae* serotypes reported by ICS countries in 2004 were 1, 4, and 7F, all of which are included in the 23-valent pneumococcal polysaccharide vaccine; serotype 4 is also included in the 7-valent conjugate vaccine. In the following table, yellow highlights the most common serotypes in each country.

***Streptococcus pneumoniae* Serotypes by Country, ICS 2004 Data**

Serotype	Finland n (%)	Greenland n (%)	Iceland n (%)	N. Canada n (%)	U.S. Arctic n (%)
1	11 (2)	2 (15)	4 (8)	11 (36)	0 (0)
2	2 (<1)	0 (0)	0 (0)	0 (0)	0 (0)
3	44 (6)	0 (0)	2 (4)	2 (7)	5 (6)
4	90 (12)	1 (8)	4 (8)	0 (0)	6 (7)
6A	17 (2)	2 (15)	1 (2)	0 (0)	1 (1)
6B	45 (6)	0 (0)	2 (4)	0 (0)	1 (1)
7C	2 (<1)	0 (0)	0 (0)	0 (0)	2 (2)
7F	44 (6)	2 (15)	11 (22)	0 (0)	6 (7)
8	12 (2)	1 (8)	0 (0)	6 (19)	4 (5)
9A	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)
9N	30 (4)	0 (0)	0 (0)	0 (0)	4 (5)
9V	65 (9)	0 (0)	7 (14)	0 (0)	1 (1)
10	5 (1)	0 (0)	0 (0)	0 (0)	0 (0)
10A	0 (0)	0 (0)	0 (0)	3 (10)	3 (4)
11	0 (0)	0 (0)	1 (2)	0 (0)	0 (0)
11A	9 (1)	0 (0)	0 (0)	0 (0)	4 (5)

Serotype	Finland n (%)	Greenland n (%)	Iceland n (%)	N. Canada n (%)	U.S. Arctic n (%)
11B	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)
12	0 (0)	0 (0)	1 (2)	0 (0)	0 (0)
12F	20 (3)	3 (23)	0 (0)	0 (0)	6 (7)
13	0 (0)	0 (0)	0 (0)	1 (3)	0 (0)
14	110 (15)	1 (8)	3 (6)	0 (0)	1 (1)
15	0 (0)	0 (0)	1 (2)	0 (0)	0 (0)
15A	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)
15B	3 (<1)	0 (0)	0 (0)	0 (0)	4 (5)
15C	4 (1)	0 (0)	0 (0)	2 (7)	1 (1)
16	4 (1)	0 (0)	0 (0)	0 (0)	0 (0)
16F	0 (0)	0 (0)	0 (0)	1 (3)	1 (1)
17	2 (<1)	0 (0)	0 (0)	0 (0)	0 (0)
17F	0 (0)	0 (0)	0 (0)	0 (0)	2 (2)
18B	2 (<1)	0 (0)	0 (0)	0 (0)	0 (0)
18C	25 (3)	0 (0)	2 (4)	1 (3)	0 (0)
18F	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)
19A	41 (6)	0 (0)	1 (2)	0 (0)	15 (18)
19F	32 (4)	0 (0)	2 (4)	1 (3)	0 (0)
20	3 (<1)	0 (0)	1 (2)	1 (3)	1 (1)
22	0 (0)	0 (0)	3 (6)	0 (0)	0 (0)
22A	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
22F	29 (4)	1 (8)	0 (0)	2 (7)	6 (7)
23A	5 (1)	0 (0)	0 (0)	0 (0)	2 (2)
23B	2 (<1)	0 (0)	0 (0)	0 (0)	1 (1)
23F	61 (8)	0 (0)	3 (6)	0 (0)	1 (1)
25	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)
31	2 (<1)	0 (0)	0 (0)	0 (0)	0 (0)
33	5 (1)	0 (0)	1 (2)	0 (0)	0 (0)
33F	0 (0)	0 (0)	0 (0)	0 (0)	2 (2)
34	1 (<1)	0 (0)	0 (0)	0 (0)	1 (1)
35A	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)
35B	7 (1)	0 (0)	0 (0)	0 (0)	1 (1)
35F	7 (1)	0 (0)	0 (0)	0 (0)	0 (0)
37	1 (<1)	0 (0)	0 (0)	0 (0)	1 (1)
38	3 (<1)	0 (0)	0 (0)	0 (0)	0 (0)
39	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)

Vaccine-Preventable Cases and Deaths

For the countries reporting serotype data, more than 83% of *S. pneumoniae* cases in persons ≥ 2 years of age were preventable with use of the 23-valent polysaccharide vaccine. Use of the 7-valent conjugate vaccine would have potentially prevented 67% of *Strep pneumoniae* cases in children < 2 years of age in Iceland. Only 6% of remaining disease in U.S. Arctic children less than 2 was vaccine preventable reflecting widespread introduction of this vaccine three years earlier and near elimination o f vaccine preventable disease in this population. The proportion of deaths potentially

preventable with use of the 23-valent polysaccharide vaccine related to *S. pneumoniae* ranged from 50% to 100%.

Proportion of Vaccine Preventable Cases/Deaths from Invasive Pneumococcal Disease, ICS 2004 Data

	Greenland n/Denom* (%)	Iceland n/Denom* (%)	N. Canada n/Denom* (%)	U.S. Arctic n/Denom* (%)
Cases ≥ 2 years old with serotype in the 23-valent pneumococcal polysaccharide vaccine	10/12 (83)	34/37 (92)	26/29 (90)	57/67 (85)
Cases < 2 years old with serotype in the 7-valent pneumococcal conjugate vaccine	0/1 (0)	6/9 (67)	0/2 (0)	1/17 (6)
Deaths (all ages) for which the serotype was contained in the 23-valent pneumococcal vaccine	1 (50‡)	6 (100‡)	1 (50‡)	12 (86‡)

*Number of isolates serotyped by country by age group
‡Percentage of total deaths

Outcome

A total of 86 deaths associated with *S. pneumoniae* were reported to ICS in 2004. Overall, the highest case fatality ratio (CFR) occurred in persons 65+ years of age (18%). Finland and N. Sweden did not report outcome data.

***Streptococcus pneumoniae* Age-Specific Case-Fatality Ratios (CFR), ICS 2004 Data**

		<2 years	2-19 years	20-64 years	65+ years	All Ages
Greenland	Deaths/Cases (CFR)	0/1 (0)	0/0 (0)	2/12 (17)	0/0 (0)	2/13 (15)
Iceland	Deaths/Cases (CFR)	0/10 (0)	0/2 (0)	1/17 (6)	5/24 (21)	6/53 (11)
N. Canada	Deaths/Cases (CFR)	1/3 (33)	0/3 (0)	1/25 (4)	0/2 (0)	2/33 (6)
Norway	Deaths/Cases (CFR)	1/67 (2)*	1/57 (3)*	15/436 (6)*	43/496 (17)*	60/1,056 (6)
U.S. Arctic	Deaths/Cases (CFR)	1/18 (6)	0/9 (0)*	10/54 (20)	5 (25)	16/100 (16)
Total	Deaths/Cases (CFR)	3/99 (4)	1/71 (2)	29/543 (8)	53 (18)	86/1,255 (7)

*Outcome unknown in (20) Norway cases < 2 years, (20) Norway and (1) U.S. Arctic cases 2-19 years, (193) Norway and (2) U.S. Arctic cases 20-64 years, (241) Norway cases 65+ years

Antimicrobial Susceptibility

In 2004, antimicrobial susceptibility results were reported to ICS from Finland, Greenland, Iceland, N. Canada, N. Sweden and the U.S. Arctic. Of those isolates tested from the U.S. Arctic, none were fully resistant to penicillin, 15.5% had intermediate resistance. The isolates that showed intermediate resistance were serotypes 19A (92%) and 23A (8%). Finland submitted results from 746 isolates; 2% were fully resistant to penicillin and 7% had intermediate resistance. The Finnish serotype data is not linked to the antimicrobial susceptibility data, so no comparisons can be made. In Iceland, 15% of isolates tested had intermediate resistance to penicillin and consisted of serotypes

9V (75%), 14 (12.5%) and 19F (12.5%). One isolate, serotype 6B, was fully resistant. N. Sweden did not report serotype data, however, only 5 isolates were tested and all were sensitive to penicillin.

***Streptococcus pneumoniae* Penicillin Susceptibility Results, ICS 2004 Data**

	# Tested	I* (%)	I* Serotypes	R* (%)	R* Serotypes
Finland	746	49 (7)	†	17 (2)	†
Greenland	11	0 (0)		0 (0)	
Iceland	53	8 (15)	9V (6), 14 (1), 19F (1)	1 (2)	6B
N. Canada	31	0 (0)		1 (3)	19F
N. Sweden	5	0 (0)		0 (0)	
U.S. Arctic	84	13 (15)	19A (12), 23A (1)	0 (0)	

*I=Intermediate resistance, R=Fully resistant
†Finnish serotype data is not linked to antimicrobial susceptibility data

Full resistance to trimethoprimsulfamethoxizole (TMP-Sulfa) was found in 24.5% of tested isolates from the Iceland, 8% from the U.S. Arctic, and 3% from N. Canada. Isolates from Iceland that were fully resistant to TMP-Sulfa were serotypes 9V (46%), 23F (15%), and one each of serotypes 6B, 7F, 19A, 19F and 33. The isolates that were fully resistant in the U.S. Arctic were serotypes 19A (71%) and 33F (29%). In N. Canada, the fully resistant isolate was serotype 19F. Intermediate resistance to TMP-Sulfa was found in 11% of tested isolates from the U.S. Arctic, 4% from Iceland and 3% from N. Canada.

***Streptococcus pneumoniae* TMP-Sulfa Susceptibility Results, ICS 2004 Data**

	# Tested	I* (%)	I* Serotypes	R* (%)	R* Serotypes
Iceland	53	2 (4)	7F (1), 23F (1)	13 (25)	6B (1), 7F (1), 9V (6), 19A (1), 19F (1), 23F (2), 33 (1)
N. Canada	30	1 (3)	18C	1 (3)	19F
N. Sweden	3	0 (0)		0 (0)	
U.S. Arctic	84	9 (11)	12F (3), 15B (1), 19A (4), 23F (1)	7 (8)	19A (5), 33F (2)

*S=Sensitive, I=Intermediate resistance, R=Fully resistant

In Iceland, 8% of tested isolates were fully resistant to erythromycin, 4% from the U.S. Arctic, and 3% from N. Canada. The serotypes found in the fully resistant isolates from the U.S. Arctic were all 19A. In Iceland, the isolates that were fully resistant to erythromycin were serotypes 14 (50%), 6B (25%) and 19F (25%).

***Streptococcus pneumoniae* Erythromycin Susceptibility Results, ICS 2004 Data**

	# Tested	I* (%)	I* Serotypes	R* (%)	R* Serotypes
Iceland	53	0 (0)		4 (8)	6B (1), 14 (2), 19F (1)
N. Canada	30	0 (0)		1 (3)	19F
N. Sweden	3	0 (0)		0 (0)	
U.S. Arctic	84	0 (0)		3 (4)	19A (3)

*S=Sensitive, I=Intermediate resistance, R=Fully resistant

Antimicrobial testing was also done for ceftriaxone, ofloxacin/levofloxacin, chloramphenicol, vancomycin, clindamycin, and rifampin. One of 30 (3%) isolates tested in N. Canada was fully

resistant to chloramphenicol (serotype 19F) and one (3%) was fully resistant to clindamycin (serotype 8). All isolates tested in N. Canada, N. Sweden and the U.S. Arctic were sensitive to ceftriaxone, ofloxacin/levofloxacin, vancomycin, and rifampin.

Quality Control

In 2004, the laboratories participating in the ICS QC program expanded to include Statens Serum Institute in Copenhagen, Denmark. Four QC panels of seven *S. pneumoniae* isolates plus a control strain each were shipped and tested. Staten Serum Institute participated in the third and fourth panels; the other three reference laboratories participated in all four panels. Serotyping correlation for the 28 challenge isolates was 99%. Overall correlation of the MIC results within +/- one $\log_2$ dilution was 96.5%. MIC discrepancies between laboratories could be explained by differing ranges of antibiotic concentrations for each drug tested or incubation methods.

Conclusions

Streptococcus pneumoniae remains a major cause of invasive bacterial disease in circumpolar regions. Disease rates are highest in indigenous populations. The impact of the conjugate vaccine is clear in the U.S. Arctic. Surveillance for evidence of impact in other circumpolar countries will be important to confirm effectiveness and provide support for continuing immunization programs.

Haemophilus influenzae

Case Demographics

Greenland, N. Canada, N. Sweden and the U.S. Arctic reported the occurrence of *H. influenzae* in each country during 2004. Greenland reported no cases and therefore will not be included in the results. A total of 25 cases of invasive disease caused by *H. influenzae* were reported to ICS during 2004 by N. Canada, N. Sweden and the U.S. Arctic. The rate of disease was higher in N. Canada (8 per 100,000) than it was in the U.S. Arctic (2 per 100,000) or N. Sweden (<1 per 100,000). Median age of cases was higher in N. Sweden and the U.S. Arctic (55 and 54 years, respectively) than in N. Canada (1 year).

***Haemophilus influenzae* Case Demographics, ICS 2004 Data**

Country	Population	# Cases	Rate*	Sex M (%)	Median Age (min-max) yrs	Deaths n (CFR†)
N. Canada	132,956	11	8.3	7 (64)	1.1 (0.4-78.8)	0 (0) ‡
N. Sweden	252,585	2	0.8	2 (100)	55.4 (23.8-87)	‡
U.S. Arctic	655,435	12	1.8	7 (58)	54.3 (0.4-91.4)	0 (0)
Total	1,040,976	25	2.4	16 (64)	11.6 (0.4-91.4)	0 (0)

*Number of cases per 100,000 per year
†Case fatality ratio
‡ Case outcome unknown in (3) N. Canada cases; N. Sweden did not report case outcomes

When stratified by age, the highest rates of disease for both N. Canada and the U.S. Arctic were in the <2 years and 65+ years age categories; no disease was reported in the <2 years age category in N. Sweden.

***Haemophilus influenzae* by Age Category, ICS 2004 Data**

Age		N. Canada	N. Sweden	U.S. Arctic
<2 yrs	Population	4,849	4,816	20,900
	Cases (%)	7 (64)	0 (0)	2 (17)
	Rate*	144.4	0	9.6
2-19 yrs	Population	44,845	53,833	193,315
	Cases (%)	2 (18)	0 (0)	2 (17)
	Rate*	4.5	0	1
20-64 yrs	Population	77,823	146,250	399,638
	Cases (%)	1 (9)	1 (50)	4 (33)
	Rate*	1.3	0.7	1
65+ yrs	Population	5,439	47,686	41,582
	Cases (%)	1 (9)	1 (50)	4 (33)
	Rate*	18.4	2.1	9.6
All ages	Population	132,956	252,585	655,435
	Cases	11	2	12
	Rate*	8.3	0.8	1.8

*Number of cases per 100,000 per year

Race

Race and ethnicity data was unknown in 3 of the 11 *H. influenzae* cases from N. Canada. Rates of disease were highest (167 per 100,000) in N. Canada Aboriginal cases less than two years of age. In the U.S. Arctic, rates of disease were higher in Native populations than in non-Native populations in all age categories.

***Haemophilus influenzae* by Race and Age Categories, ICS 2004 Data**

Age (yrs)		N. Canada*		U.S. Arctic	
		Aboriginal	Non-Aboriginal	Native	Non-Native
<2	Population	3,597	1,252	5,993	14,907
	Cases (rate†)	6 (166.8)	0 (0)	1 (16.7)	1 (6.7)
2-19	Population	31,840	13,005	48,236	145,079
	Cases (rate†)	1 (3.1)	0 (0)	1 (2.1)	1 (0.7)
20-64	Population	37,377	40,446	65,644	333,994
	Cases (rate†)	0 (0)	0 (0)	1 (1.5)	3 (0.9)
65+	Population	3,036	2,403	7,135	34,447
	Cases (rate†)	0 (0)	1 (41.6)	1 (14)	3 (8.7)
All Ages	Population	75,850	57,106	127,008	528,427
	Cases (rate†)	7 (9.2)	1 (1.8)	4 (3.1)	8 (1.5)

*Race unknown in 1 case <2 years, 1 case 2-19 years, 1 case 20-64 years
†Number of cases per 100,000 per year

Clinical Presentation

In N. Canada and the U.S. Arctic, the most common clinical presentation associated with *H. influenzae* was pneumonia (45% and 42% of reported cases, respectively). The two cases reported in N. Sweden presented with bacteremia.

Clinical Presentation of Reported *Haemophilus influenzae* Cases, ICS 2004 Data

	N. Canada n (%)	N. Sweden n (%)	U.S. Arctic n (%)
Pneumonia*	5 (45)	0 (0)	5 (42)
Septicemia	0 (0)	0 (0)	2 (17)
Bacteremia	2 (18)	2 (100)	0 (0)
Meningitis	3 (27)	0 (0)	3 (25)
Empyema	0 (0)	0 (0)	1 (8)
Cellulitis	1 (9)	0 (0)	0 (0)
Peritonitis	0 (0)	0 (0)	1 (8)
Total	11	2	12

*with bacteremia

Risk Factors

Fifty percent of adult (≥ 18 years) cases of *H. influenzae* reported in the U.S. Arctic indicated chronic lung disease as an associated risk factor, 25% smoked and 1 case each indicated alcohol, immune suppressive treatment or diabetes as an associated risk factor. No risk factors were reported in the two Canadian adult cases of *H. influenzae*.

Vaccination Status

The *H. influenzae* type b (Hib) conjugate vaccine is required as part of routine childhood vaccination in N. Canada and the U.S. Arctic. One case of Hib was reported in both N. Canada and the U.S. Arctic in children less than five years. The Hib case in the U.S. Arctic had received 2 doses of Hib vaccine; the N. Canadian Hib case had received 1 dose.

***Haemophilus influenzae* Case Vaccination Status for Hib Vaccine, ICS 2004 Data**

	N. Canada	U.S. Arctic
Total cases eligible for Hib vaccine*	8	2
Vaccine status known in cases eligible for Hib vaccine	6	1
Cases eligible for Hib vaccine vaccinated (%)†	6 (100)	1 (100)

*Children less than 5 years of age
†Percent of vaccine status known cases

Serotypes

***Haemophilus influenzae* Serotypes by Country, ICS 2004 Data**

Serotype	N. Canada n (%)	U.S. Arctic n (%)
a	6 (55)	0 (0)
b	1 (9)	2 (18)
c	1 (9)	0 (0)
f	0 (0)	4 (36)
Non-typeable	3 (27)	5 (45)
Total	11	11*

*Of 12 *H. influenzae* cases in the U.S. Arctic, 11 were serotyped

The most common *H. influenzae* serotype in N. Canada was type a (55% of cases); in the U.S. Arctic it was type f (36% of cases). Non-typeable cases also made up a large proportion of cases in each country; 45% in the U.S. Arctic and 27% in N. Canada. N. Sweden did not provide serotype data.

Outcome

No deaths were associated with *H. influenzae* cases reported to ICS in 2004 from the U.S. Arctic and N. Canada. N. Sweden did not provide outcome data.

Conclusions

Widespread use of Hib conjugate vaccines has led to the virtual disappearance of Hib disease in these populations. Substantial replacement with other serotypes has not occurred.

Neisseria meningitidis

Case Demographics

The U.S. Arctic was the only ICS region to report the occurrence of *N. meningitidis* during 2004. A total of 5 cases of invasive disease caused by *N. meningitidis* were reported to ICS. All five cases were serogroup B. Two deaths associated with *N. meningitidis* were reported in the U.S. Arctic.

***Neisseria meningitidis* Case Demographics, ICS 2004 Data**

Country	Population	# Cases	Rate*	Sex M (%)	Median Age (range) yrs	Deaths n (CFR†)
U.S. Arctic	655,435	5	0.8	4 (80)	17.3 (0.8-60.9)	2 (40)

*Number of cases per 100,000 per year
†Case fatality ratio

When stratified by age, the highest rates of disease occurred in cases less than two years of age (4.8/100,000). Rates in other age categories were 1/100,000 for the 2-19 years category and 0.5/100,000 in the 20-64 years category.

Race

In the U.S. Arctic, four of the five cases occurred in non-Native persons. Overall rates of disease in AK Native and non-Native persons are the same (0.8/100,000 persons per year).

Clinical Presentation

Two of the five *N. meningitidis* cases in the U.S. Arctic presented with meningitis; two presented with septicemia.

Risk Factors

In the U.S. Arctic, smoking and alcohol abuse were each reported in association with one adult (≥ 18 years) case.

Conclusions

Neisseria meningitidis is a relatively uncommon cause of invasive bacterial disease in the circumpolar area under surveillance and, in contrast to the others evaluated in this system, occurs at similar rates in Alaska Natives and non-Natives.

Group A *Streptococcus*

Case Demographics

Greenland, N. Canada, N. Sweden and the U.S. Arctic each reported the occurrence of GAS during 2004. Greenland reported no cases and therefore will not be included in the results. A total of 41 cases of invasive disease caused by GAS were reported to ICS. The rate of disease was highest in N. Canada (7.5 per 100,000) compared to the U.S. Arctic (4 per 100,000) and N. Sweden (2 per 100,000). Four deaths were associated with GAS, two in N. Canada and two in the U.S. Arctic.

Group A *Streptococcus* Case Demographics, ICS 2004 Data

Country	Population	# Cases	Rate*	Sex M (%)	Median Age (range) yrs	Deaths n (CFR†)
N. Canada	132,956	10	7.5	5 (50)	37.6 (0.2-73.6)	2 (20)
N. Sweden	252,585	5	2	2 (40)	67.1 (63.1-90.6)	‡
U.S. Arctic	655,435	26	4	11 (42)	42.8 (0.4-93.4)	2 (7.7)
Total	1,040,976	41	3.9	18 (44)	50 (0.2-93.4)	4 (9.8)

*Number of cases per 100,000 per year
†Case fatality ratio
‡Outcomes not reported from N. Sweden

When stratified by age, the highest rates of disease occurred in children <2 years and in individuals 65+ years of age in N. Canada (62 per 100,000 and 37 per 100,000, respectively).

Group A *Streptococcus* by Age Category, ICS 2004 Data

Age		N. Canada	N. Sweden	U.S. Arctic
<2 yrs	Population	4,849	4,816	20,900
	Cases (%)	3 (30)	0 (0)	2 (8)
	Rate*	61.9	0	9.6
2-19 yrs	Population	44,845	53,833	193,315
	Cases (%)	0 (0)	0 (0)	4 (15)
	Rate*	0	0	2.1
20-64 yrs	Population	77,823	146,250	399,638
	Cases (%)	5 (50)	1 (20)	11 (42)
	Rate*	6.4	0.7	2.8
65+ yrs	Population	5,439	47,686	41,582
	Cases (%)	2 (20)	4 (80)	9 (35)
	Rate*	36.8	8.4	21.6
All ages	Population	132,956	252,585	655,435
	Total Cases	10	5	26
	Rate*	7.5	2	4

*Number of cases per 100,000 per year

Race

Race and ethnicity data were collected by N. Canada and the U.S. Arctic. All GAS cases reported in N. Canada occurred in Aboriginals. In the U.S. Arctic, overall rates of disease were five times higher in AK Natives than non-Natives.

Group A *Streptococcus* by Race and Age Categories, ICS 2004 Data

Age (yrs)		N. Canada*		U.S. Arctic	
		Aboriginal	Non-Aboriginal	Native	Non-Native
<2	Population	3,597	1,252	5,993	14,907
	Cases (rate†)	3 (83.4)	0 (0)	2 (33.4)	0 (0)
2-19	Population	31,840	13,005	48,236	145,079
	Cases (rate†)	0 (0)	0 (0)	3 (6.2)	1 (0.7)
20-64	Population	37,377	40,446	65,644	333,994
	Cases (rate†)	4 (10.7)	0 (0)	5 (7.6)	6 (1.8)
65+	Population	3,036	2,403	7,135	34,447
	Cases (rate†)	2 (65.9)	0 (0)	4 (56.1)	5 (14.5)
All Ages	Population	75,850	57,106	127,008	528,427
	Cases (rate†)	9 (11.9)	0 (0)	14 (11)	12 (2.3)

*Race unknown in 1 N. Canada case 20-64 years
†Number of cases per 100,000 per year

Clinical Presentation

In the U.S. Arctic, 42% of GAS cases presented clinically with cellulitis, 15% presented with septicemia and 11.5% presented with pneumonia or septic arthritis. Half of the cases in N. Canada presented with cellulitis, two each with necrotizing fasciitis and pneumonia and one with septicemia. Eighty percent of cases in N. Sweden presented with bactermia; one case (20%) presented with septic arthritis.

Clinical Presentation of Reported group A *Streptococcus* Cases, ICS 2004 Data

	N. Canada n (%)	N. Sweden n (%)	U.S. Arctic n (%)
Pneumonia*	2 (20)	0 (0)	3 (11.5)
Bacteremia	0 (0)	4 (80)	0 (0)
Septicemia	1 (10)	0 (0)	4 (15)
Empyema	0 (0)	0 (0)	1 (4)
Cellulitis*	5 (50)	0 (0)	11 (42)
Necrotizing fasciitis	2 (20)	0 (0)	0 (0)
Septic arthritis	0 (0)	1 (20)	3 (11.5)
Osteomylitis	0 (0)	0 (0)	1 (4)
Endometritis	0 (0)	0 (0)	1 (4)
Bursitis	0 (0)	0 (0)	1 (4)
Other	0 (0)	0 (0)	1 (4)
Total	10	5	26

*with bacteremia

Risk Factors

Cigarette smoking was associated with 43% and 29% of adult (≥18 years) GAS cases in N. Canada and the U.S. Arctic, respectively. Fourteen percent of N. Canada and U.S. Arctic case reviews indicated alcohol abuse as a risk factor. In the U.S. Arctic, 14% of case reviews indicated diabetes and 5% indicated chronic lung disease or immune suppressive therapy. N. Sweden did not report risk factor data.

Outcome

Two deaths in cases with GAS were reported from the U.S. Arctic (CFR 8%); one death occurred in each of the 2-19 year old and 65+ years old age categories. Two deaths were reported in N. Canada (CFR 20%); one death occurred in each of the < 2 years and 20-64 year old age categories. N. Sweden did not report case outcome data.

Conclusions

These data suggest markedly higher rates in indigenous populations. Increased awareness of risk may help target improved treatment responses.

Group B *Streptococcus*

Case Demographics

Greenland, N. Canada, N. Sweden and the U.S. Arctic each reported the occurrence of GBS during 2004. Greenland reported no cases and therefore will not be included in the results. A total of 48 cases of invasive disease caused by GBS were reported to ICS. The rate of disease was highest in the U.S. Arctic and N. Sweden (5 per 100,000) compared to N. Canada (1.5 per 100,000). Three deaths were reported in the U.S. Arctic associated with GBS in 2004.

Group B *Streptococcus* Case Demographics, ICS 2004 Data

Country	Population	# Cases	Rate*	Sex M (%)	Median Age (range) yrs	Deaths n (CFR†)
N. Canada	132,956	2	1.5	0 (0)	41.9 (31.4-52.4)	0 (0)‡
N. Sweden	252,585	12	4.8	5 (42)	65.6 (0-84.2)	‡
U.S. Arctic	655,435	34	5.2	20 (59)	53.8 (0-80.1)	3 (9)‡
Total	1,040,976	48	4.6	25 (52)	53.8 (0-84.2)	3 (10)

*Number of cases per 100,000 per year
†Case fatality ratio
‡Outcome unknown in (1) N. Canada case, (1) U.S. Arctic case; no outcomes reported from N. Sweden

When stratified by age, the highest rates of disease occurred in cases less than two years of age in N. Sweden (62 per 100,000) and the U.S. Arctic (57 per 100,000).

Group B *Streptococcus* by Age Category, ICS 2004 Data

Age		N. Canada	N. Sweden	U.S. Arctic
<2 yrs	Population	4,849	4,816	20,900
	Cases (%)	0 (0)	3 (25)	12 (35)
	Rate*	0	62.3	57.4
2-19 yrs	Population	44,845	53,833	193,315
	Cases (%)	0 (0)	0 (0)	0 (0)
	Rate*	0	0	0
20-64 yrs	Population	77,823	146,250	399,638
	Cases (%)	2 (100)	3 (25)	11 (32)
	Rate*	2.6	2.1	2.8
65+ yrs	Population	5,439	47,686	41,582
	Cases (%)	0 (0)	6 (50)	11 (32)
	Rate*	0	12.6	26.5
All ages	Population	132,956	252,585	655,435
	Total Cases	2	12	34
	Rate*	1.5	4.8	4.6

*Number of cases per 100,000 per year

Three of twelve cases that occurred in the U.S. Arctic and two of three cases that occurred in N. Sweden in the less than 2 years age category were early onset (less than 7 days old) for rates of 0.3 and 0.8 per 1,000 births, respectively.

Race

Race and ethnicity data was collected in N. Canada and the U.S. Arctic. The overall rate of disease caused by GBS in AK Natives was twice that in non-Natives. No cases of GBS were reported in N. Canada Aboriginals.

Group B *Streptococcus* by Race and Age Categories, ICS 2004 Data

Age (yrs)		N. Canada†		U.S. Arctic†	
		Aboriginal	Non-Aboriginal	Native	Non-Native
<2	Population	3,597	1,252	5,993	14,907
	Cases (rate*)	0 (0)	0 (0)	6 (100.1)	6 (40.2)
2-19	Population	31,840	13,005	48,236	145,079
	Cases (rate*)	0 (0)	0 (0)	0 (0)	0 (0)
20-64	Population	37,377	40,446	65,644	333,994
	Cases (rate*)	0 (0)	1 (2.5)	2 (3)	9 (2.7)
65+	Population	3,036	2,403	7,135	34,447
	Cases (rate*)	0 (0)	0 (0)	3 (42)	7 (20.3)
All Ages	Population	75,850	57,106	127,008	528,427
	Cases (rate*)	0 (0)	1 (1.8)	11 (8.7)	22 (4.2)

†Race unknown in 1 N. Canada case 20-64 years, 1 U.S. Arctic case 65+ years
*Number of cases per 100,000 per year

Clinical Presentation

In the U.S. Arctic, septicemia (41%) was the most common clinical presentation reported for cases of GBS in 2004 followed by cellulitis (15%), pneumonia (12%) and endocarditis (12%). One case in N. Canada presented with bacteremia; the second case presented with an unidentified other condition. All cases in N. Sweden were reported as bacteremia which may reflect a difference in reporting practices..

Clinical Presentation of Reported group B *Streptococcus* Cases, ICS 2004 Data

	N. Canada n (%)	N. Sweden n (%)	U.S. Arctic n (%)
Pneumonia*	0 (0)	0 (0)	4 (12)
Bacteremia	1 (50)	12 (100)	2 (6)
Septicemia	0 (0)	0 (0)	14 (41)
Meningitis	0 (0)	0 (0)	3 (9)
Cellulitis*	0 (0)	0 (0)	5 (15)
Endocarditis	0 (0)	0 (0)	4 (12)
Septic arthritis	0 (0)	0 (0)	1 (3)
Other	1 (50)	0 (0)	1 (3)
Total	2	12	34

*with bacteremia

Risk Factors

Fifty percent of GBS adult (≥ 18 years) cases in N. Canada (1 case) and the U.S. Arctic reported diabetes as a risk factor in 2004. In the U.S. Arctic, alcohol abuse was reported in 18% of cases, smoking in 14% and chronic lung disease and immune suppressive therapy each in 5%.

Outcome

Three deaths in cases with GBS were reported in the U.S. Arctic (CFR 9%); two deaths occurred in the 20-64 years age category and one death in the 65+ age category. No deaths were reported in Canada; outcome was unknown in one case. N. Sweden did not report case outcome data.

CONCLUSIONS

The ICS program continued to expand in 2004. The *Streptococcus pneumoniae* Quality Control program expanded to include Staten Serum Institute in Copenhagen, Denmark. Monitoring rates of disease and levels of antimicrobial resistance in these pathogens via use of the ICS system is important in providing data on groups at risk for disease, measurement of effectiveness of prevention measures, and emerging challenges in serotype distribution and antimicrobial resistance. Efforts to expand ICS to include all circumpolar nations will continue.

ACKNOWLEDGMENTS

ICS is a cooperative project funded by the Coordinating Center for Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia, and by the Public Health Agency of Canada in Ottawa, Canada.

We would like to thank all individuals involved in ICS at participating laboratories and public health departments.

SOURCE

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REFERENCES

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