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Infectious Diseases in Finland 2008

REPORT

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INFECTIOUS DISEASES IN FINLAND 2008



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In addition to commentary, the report includes figures and tables that are not employed in our regular reporting. Distributions by gender, age and region are available on our website. The figures for some of the diseases in the National Infectious Diseases Register (NIDR) will still be updated after the figures have been published in print. Up-to-date figures are available at <http://www3.ktl.fi>.

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INTRODUCTION

On 1 January 2009, The National Public Health Institute (KTL) and STAKES merged to form a new organisation, the National Institute for Welfare and Health (THL). This new institute has the same obligations and authority as KTL in the field of surveillance and prevention of infectious diseases. The new organisation with its diverse resources offers increasingly better surveillance opportunities, for example, by utilising the national patient record systems that are under development. The prevention and control of infectious diseases has been organised in a manner that enables even closer co-operation among specialists in the fields of epidemiology, microbiology, data management, and other applicable fields.

The European Centre for Disease Prevention and Control (ECDC) integrated all data collection under one data system (TESSy) it administers; the ECDC utilises this system to publish reports on different classes of communicable diseases. Before, the data were collected in separate disease-specific databases. The ECDC, established in 2005, has proved its usefulness in many ways in international situations requiring urgent response, and it has published scientific reviews by groups of experts to support prevention.

In 2008, the National Infectious Diseases Register (NIDR) launched tuberculosis outcome surveillance and a pilot project that will enable doctors to report infectious diseases electronically

in the near future. Anticipating this, doctors have been providing notification of communicable diseases directly to THL since 1 January 2009.

Overview

Among respiratory infections, an extensive resistance to oseltamivir that has rapidly become more common in the influenza A, subtype H1N1 virus is causing concern. The increased resistance had no correlation with the amount of antiviral used, and the virulence of the resistant viruses is equal to that of those susceptible to antiviral drugs. The resistance has an effect on the possibility of using the medication to treat seasonal influenza and on the role of drugs in preparation for a possible pandemic. The development of this resistance provides more solid grounds for strengthening the administration of vaccinations to elderly people and to medical risk groups to bring the coverage to a reasonable European level and for reinforcing the recently started administration of influenza vaccination to children. That the number of whooping cough cases has remained low and there have been no cyclic epidemics as are typical of the disease indicates that the whooping cough vaccination programme that was updated this decade has reduced the incidence of the disease.

The number of campylobacter infections was one of the highest in the

history of the NIDR, although there were no major campylobacter outbreaks. By the time of completion of this report, the salmonella contamination of the feed in poultry production facilities that was noticed at the beginning of 2009 was not evident in the number of human cases caused by the same salmonella serotypes in 2008. The number of norovirus cases has increased to a higher level than a few years ago; this is most likely due to implementation of microbiological diagnostics for norovirus in more general use than just during epidemics and institutional outbreaks. In addition to children, adults fell ill with hand, foot, and mouth disease with exceptional symptoms during the severe hand, foot, and mouth disease outbreak in the autumn of 2008.

Food- and water-borne outbreaks included the first extensive *Cryptosporidium parvum* outbreak in Finland and a normal *Yersinia pseudotuberculosis* outbreak in which the infection spread through carrots. The investigation of the water epidemic in Nokia in November 2007 continued in 2008 in an exceptionally large number of directions.

The number of hepatitis A and acute hepatitis B cases remained at the low level of the previous years. The total number of newly reported hepatitis C cases is decreasing, but, unlike in the rest of Finland, the incidence has increased in Northern Finland, especially in the last few years.

The situation with sexually transmitted diseases remained the same apart from HIV infection, where the number of cases decreased significantly after two high-incidence years. The

continuous high number of chlamydia cases, totalling almost 14,000, and that the majority of the HIV cases are related to heterosexual contact prove that there is a need to promote more effective prevention of sexually transmitted diseases.

The antimicrobial resistance situation is getting worse. There were clearly more new MRSA cases reported in 2008 than in the two preceding years, and the numbers for MRSA detection from blood are also slowly increasing. There were almost 2,000 cases of the new third-generation *Escherichia coli* and *Klebsiella pneumoniae* ESBL findings with reduced susceptibility to cephalosporin or with resistance to cephalosporin.

In different countries, there were reports of especially severe cases of *Clostridium difficile*, subtype 027, in particular, which causes diarrhoea related to antimicrobial treatment. *C. difficile* findings became reportable after a 10-year break at the beginning of 2008, and strains isolated from severe cases were typed. *C. difficile* was the second most common microbe by number reported to the NIDR, and typing indicated that, geographically, PCR ribotype 027 is widespread in Finland.

The drop in the number of tuberculosis cases stopped in 2007–2008. The reason for the slight increase in the total number of cases is the change in the criteria for notification of cases in accordance with the new case definitions of the European Union. However, there is no worsening visible in cases confirmed by culture where the criteria have not changed. There have

been no signs of increased tuberculosis among children since the vaccination programme was changed in 2006 to administer a BCG vaccination only to risk groups. However, the outbreak in Pirkkala highlights the importance of preventing tuberculosis and of early diagnosis.

Reporting showed a record number of Puumala virus cases causing epidemic nephropathy. The region where the TBE virus causing tick-borne encephalitis is endemic is spreading slowly after the place of acquisition has been systematically investigated; in 2008, there were individual occurrences in Simo and Varkaus.

There were more malaria cases than usual; the main reason for this was failure to use malaria prophylaxis, or its irregular use, in visitors to Gambia.

The number of severe systemic infections detected in blood cultures

has increased every year and reached the 10,000-case threshold in 2008. As regards prevention opportunities, pneumococcus, which caused a record number of 900 cases confirmed by blood culture, is especially current. A national expert group has proposed that Finland should include a pneumococcal conjugate vaccine in the national vaccination programme as one of the last countries in the European Union to do so. International studies indicate that vaccination of children has led to significant herd immunity, which means that the number of cases has also dropped clearly in older age groups.

Helsinki, 14 April 2009

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RESPIRATORY INFECTIONS

Influenza A

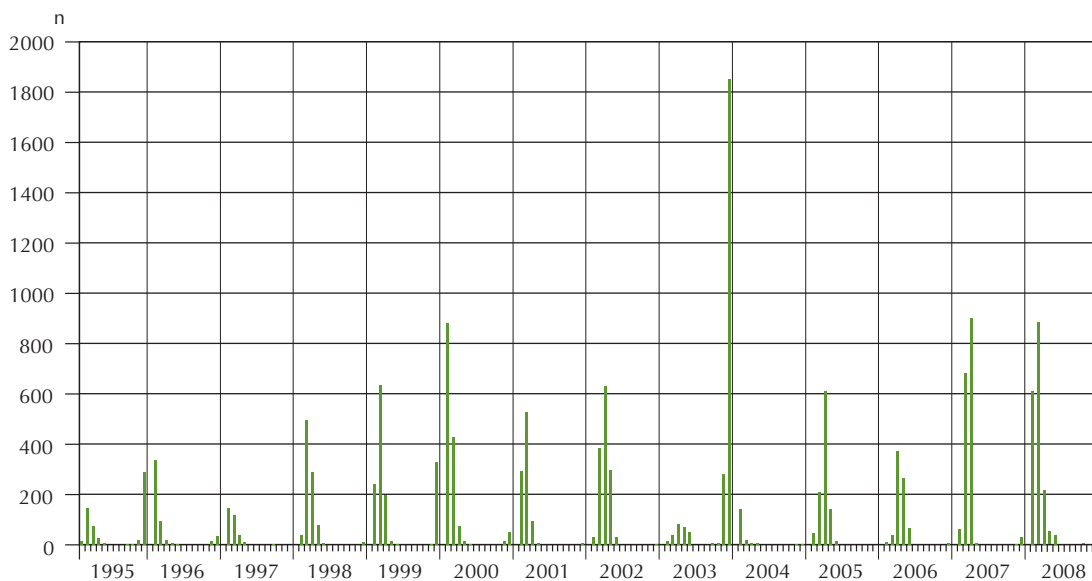
After a seven-year break, influenza A subtypes (H1N1) were responsible for the outbreak of influenza A in the 2007–2008 epidemic season. In 2000, a new epidemic variant, the A/New Caledonia/20/99 virus, was chosen as the H1N1 vaccine virus. This virus caused an extensive outbreak in Finland in winter 2000–2001, especially among children and young adults. The same virus was kept in the vaccine virus for the next six years. Viruses such as A/New Caledonia/20/99 caused only isolated occurrences or small outbreaks yearly both in Finland and elsewhere in the world. An antigenic variation in the H1N1 virus occurred in 2006; on

the basis of this antigenic variation, the WHO recommended bringing a new variant, A/Solomon Islands/3/2006, into use as a vaccine virus at the beginning of 2007. This virus caused the influenza A outbreak in winter 2007–2008.

In autumn 2007, a free influenza vaccination was offered to children under three years of age for the first time. When the virus causing the outbreak is very closely related to the vaccine virus, we can assume that the recommended regimen of two doses of vaccination before the start of the outbreak provides good immunity.

In October–November 2007, only individual occurrences of influenza A were reported; in December, the number of reported cases increased slightly.

Figure 1. Influenza A cases by month, 1995–2008.



The actual epidemic peaked in January–February 2008. In garrisons, the epidemic started right after new conscripts arrived in the second week of January. Of all cases of influenza A diagnosed in January, about one case in three was diagnosed in the group of 15–24-year-olds, of whom the majority were conscripts. After this, the epidemic also spread to general population. In February, more than a third of the influenza A cases were diagnosed in children under 10 years of age. Influenza A (H1N1) viruses are usually considered viruses that affect children and young adults. This was once again evident in 2007–2008, when 31% of the cases reported to the NIDR were diagnosed in children under age 10 and 18% in the 10–19 age group. Almost 45% of all cases were diagnosed in 20–49-year-olds, with only a scant two per cent in people over 59 years of age. In 2007–2008, subtype H3N2 of the influenza A virus caused only isolated occurrences in Finland.

In January 2008, influenza A (H1N1) viruses with resistance to oseltamivir (Tamiflu®) were observed in Europe; however, the medicine had not been used more than in previous years. Resistant viruses were able to spread from one person to another and to cause common symptoms of influenza. The resistant viruses were detected both in Finland and elsewhere in the world. We are monitoring the situation closely.

Influenza B

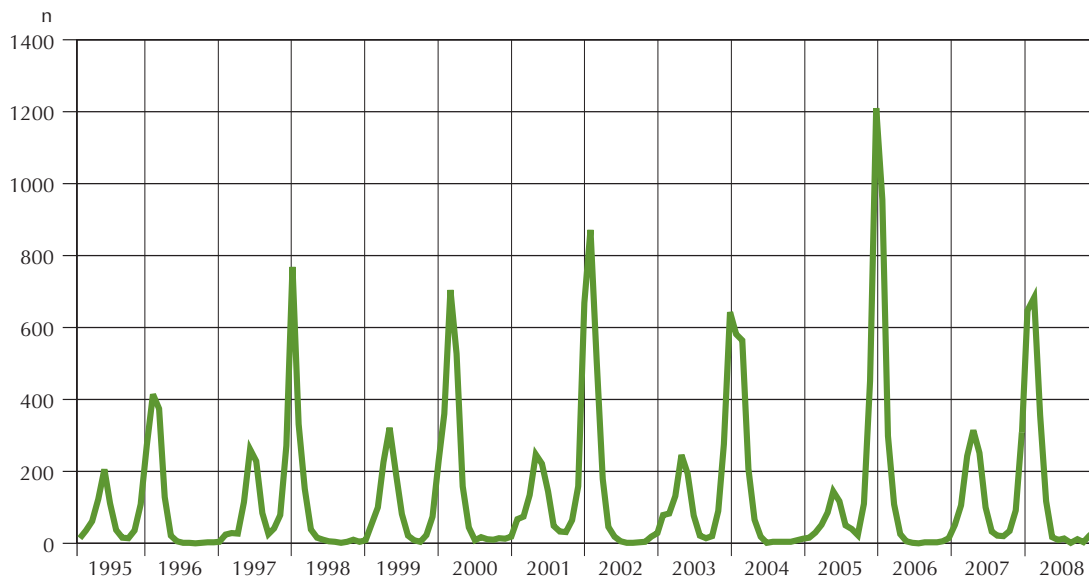
In winter 2007–2008, the number of influenza B cases reported to the NIDR totalled 1,807, which is nearly equal

to the number of influenza A cases. There are two lineages of influenza B virus, Yamagata and Victoria. The autumn 2007 vaccine included the B/Malaysia/2506/2004 virus, which was already in the vaccine of the previous year. This virus represents the Victoria lineage. However, the influenza B outbreak in winter 2007–2008 was caused by the Yamagata lineage, which means that the protection given by the vaccine was relatively weak. Only 43 cases of influenza B were diagnosed toward the end of 2007. The epidemic developed during January 2008, and in February–March there were several cases of influenza B. Then, 332 influenza B cases were reported to the NIDR in April. Children under 10 years of age accounted for almost 25% of all influenza B cases, with the same number of cases diagnosed among 30–39-year-olds. Is it possible that the virus has spread from children to their parents? In the 15–24 age group, which includes conscripts, diagnosed influenza B cases accounted for only a little over five per cent of all cases, as many as in over-59-year-olds. There were still cases of influenza B in May, when 50 cases were diagnosed.

Respiratory syncytial virus (RSV)

In 2008, 1,900 cases of RSV confirmed with laboratory tests were reported to the NIDR (incidence: 36/100,000). This is a three-year record. The previous peak, with 2,330 cases, was observed in 2005. In Finland, RSV follows a regular two-year pattern; in uneven years, there

Figure 2. RSV by month, 1995–2008.



is a minor epidemic in the spring, with a more violent attack in the following winter. In 2008, there was a winter epidemic that peaked in February. The incidence of RSV varied by hospital district (4–52/100,000), most likely caused by differences in the use of laboratory diagnostics. As before, nine out of 10 RSV cases were diagnosed in 0–4-year-olds. Even though infections occur in all age groups, babies and small children constitute the majority of cases leading to hospitalisation and laboratory diagnostics.

Legionella

In 2008, twenty-eight cases of Legionella were reported to the register on the basis of laboratory findings. In six cases, the diagnosis was based on detection of antigen in the urine, in two cases on sputum or bronchoalveolar lavage fluid culture or PCR, and the rest

on serological methods. In further investigations, the clinical picture was found to be consistent with legionellosis in 17 cases; in other words, the patient had symptom-based or radiologically diagnosed pneumonia. All six patients whose Legionella was confirmed by a urinary antigen test had pneumonia, as did the patients whose Legionella was detected in a sputum or BAL fluid culture. Of the patients, 16 were men and 12 were women. Their ages ranged from 20 to 82 years. In 2008, a 57-year-old woman died of legionellosis. She suffered from multiple diseases and had visited Turkey before falling ill. As before, about half of the legionellosis patients had been abroad prior to falling ill. Twelve of them had lived in a hotel while abroad. The accommodation data of these patients were reported to EWGLINET (European Surveillance Scheme for Travel Associated Legionnaires' Disease), which collects data on travel-associated Legionella.

Whooping cough (*Bordetella pertussis*)

In 2008, the number of whooping cough cases reported to the NIDR totalled 511 (10/100,000). The number of cases has remained stable for the past few years and has clearly decreased since the record year 2003–2004. The majority of cases were diagnosed from antibody testing. Twenty-nine of the patients were under 12 months old, with 19 under three months old. As in the previous year, the majority of patients (131) were 15–19 years of age. Before, the majority of cases were diagnosed in younger children and schoolchildren. In 2008, about half of the cases were diagnosed in over-20-year-olds. That whooping cough has

been diagnosed in older age groups in increasing amounts is most likely a consequence of the booster vaccinations that have been administered to six-year-olds since 2003 and to four- and 14-year-olds since 2005. Once again, incidence of whooping cough varied by hospital district (2–39/100,000). Incidence rates were highest in the hospital district of Keski-Pohjanmaa and lowest in the hospital district of Itä-Savo.

Figure 3. Whooping cough by month, 1995–2008.



GASTROINTESTINAL INFECTIONS

Salmonella

The year saw a total of 3,142 cases of salmonella reported to the register, compared with 2,753 cases in the year before. In 2007 and 2008, there were more reported cases than in the preceding years. Fifty-four per cent of the patients were women. Annual incidence in the entire country was 59/100,000 population. Incidence was highest in the hospital districts of Itä-Savo (79/100,000) and Satakunta (75/100,000) and lowest in the hospital districts of Kainuu (31/100,000) and Länsi-Pohja (33/100,000). Incidence was highest (83–89/100,000) in 20–49-year-olds and lowest (10/100,000) in over-70-year-olds.

The most common Salmonella serotypes were Enteritidis (983 cases), Typhimurium (255 cases), Stanley (132 cases), and Virchow (110 cases). More than one salmonella serotype was detected in 43 patients.

There were two diagnosed cases of the Typhi serotype, which causes typhoid; six cases of *S. Paratyphi A*, which causes paratyphoid; and five cases of *S. Paratyphi B*. All cases of *S. Typhi* and *S. Paratyphi A* were contracted abroad. *S. Paratyphi A* infections were most commonly acquired in India. Three out of five patients with *S. Paratyphi B* had been abroad: in Turkey, in Bangladesh, and in Iraq.

The total number of domestically acquired salmonella infections was

380 (14%), similar to the figure for 2007, with an incidence of 7/100,000 population. Forty-eight different serotypes caused domestic salmonella infections. The leading five serotypes were Typhimurium (22%), Newport (19%), Enteritidis (13%), Reading (7%), and Mikawasima (6%). The *S. Newport*, Reading, and Mikawasima cases were mainly connected to the outbreaks caused by these serotypes. Endemic phage type FT1 caused the majority of the domestic *S. Typhimurium* cases. Sixty-nine per cent of the cases were susceptible to antimicrobials with an STYMXB.0098 DNA profile.

The total number of foreign salmonella infections was 2,605, and the incidence was 49/100,000 population. The salmonella infections acquired abroad represented in excess of 100 serotypes. The *S. Enteritidis* serotype caused 1,066 (41%) of the cases with foreign origin. The next most common serotypes acquired abroad were Typhimurium (198 cases), Stanley (136), Virchow (115), and Newport (76). The leading countries of acquisition were Thailand (35%), Greece (9%), Egypt (5%), and Turkey (5%).

There were 935 strains phage-typed from the foreign Enteritidis strains and 170 from the Typhimurium strain. The prevailing phage types among Enteritidis were FT 21 (20%), FT 14b (14%), and FT 1 (13%) and among Typhimurium were FT NST (24%), FT 195 (18%), and FT 120 (14%).

According to ‘epidemiological’ susceptibility testing involving 12 antimicrobials, seven per cent of Finnish and 14% of foreign salmonellas were multiresistant (i.e., resistant to at least four antimicrobials). Nalidixic acid is used in epidemiological susceptibility testing, and data on lowered susceptibility (R or I) to nalidixic acid can be used to predict reduced susceptibility (MIC \geq 0.125 mg/L) to fluoroquinolones. Eight per cent of domestic strains and 28% of foreign strains showed disk susceptibility R or I to nalidixic acid. Of these, 90% showed reduced susceptibility to ciprofloxacin and two per cent were completely resistant (MIC \geq 4.0 mg/L).

Campylobacter

In 2008, the NIDR received 4,453 notifications of campylobacter infections.

This is eight per cent (346 cases) higher than in 2007. *Campylobacter jejuni* was clearly the prevailing campylobacter species (3,468 cases). There were 202 reported cases of *C. coli* and 780 untyped campylobacter findings. The incidence rate in the entire population was 85/100,000. Fifty-two per cent of the patients were men. The highest incidence was among 30–34-year-olds (173/100,000). Incidence was highest in the hospital district of Helsinki and Uusimaa (135/100,000). The seasonal variation was typical for campylobacter: incidence was highest in July–August.

In 3,223 cases (72%), information was obtained about recent travels abroad. Of the patients concerned, 77% had been abroad just before falling ill. The leading countries of acquisition were Thailand (431 cases), India (217 cases), Spain (210), and Turkey (195).

Figure 4. Salmonella and campylobacter cases by month, 1995–2008.

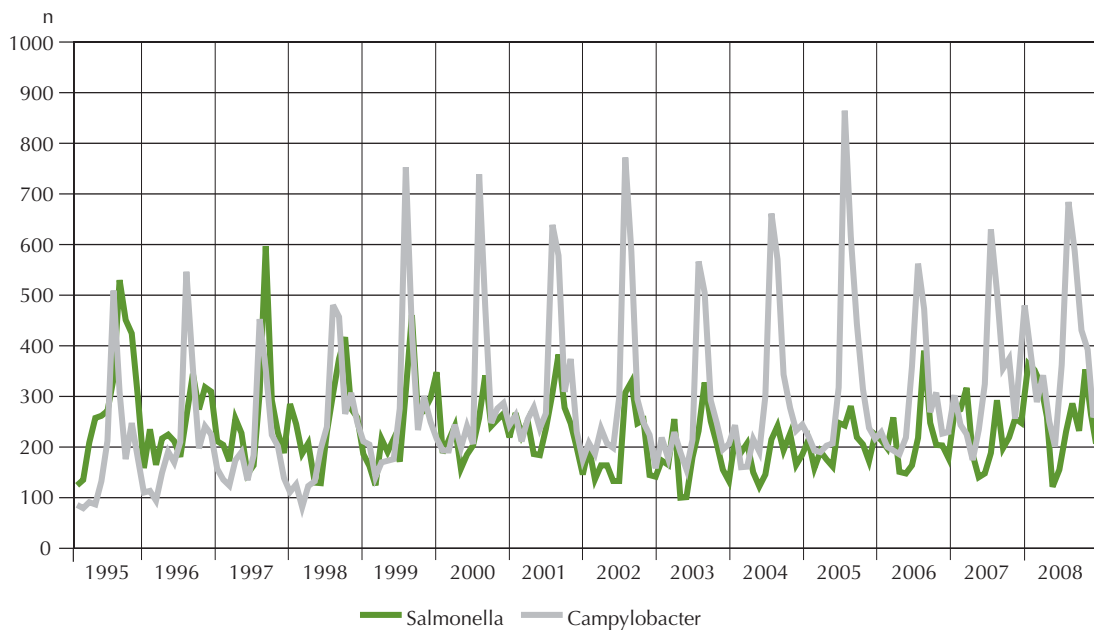
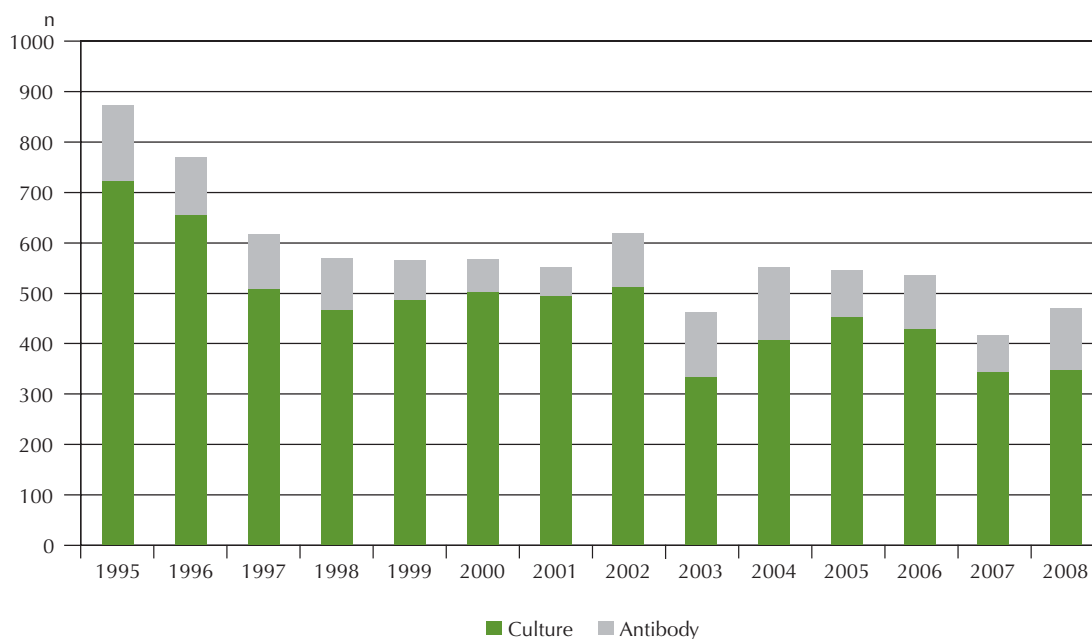


Table 1. The most common serotypes of salmonella cases, 1997–2008.
(S. Typhi and S. Paratyphi not included).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Infections acquired abroad												
Salmonella Enteritidis	912	944	892	1046	1238	904	907	774	834	879	735	1066
Salmonella Typhimurium	159	133	103	204	139	115	135	166	194	141	246	198
Salmonella Virchow	85	82	76	49	79	55	67	74	88	80	135	115
Salmonella Hadar	57	79	112	125	96	69	58					
Salmonella Newport	34							53		66		76
Salmonella Infantis		67										
Salmonella Braenderup			38	49								
Salmonella Stanley					62	65	67	105	113	116	175	136
Salmonella Corvallis									60		59	
Other	758	827	680	747	757	636	628	665	654	745	920	1014
Total	2005	2132	1901	2220	2371	1844	1862	1837	1943	2027	2270	2605
Domestically acquired infections												
Salmonella Typhimurium	499	222	375	124	152	222	137	131	240	170	150	80
Salmonella Enteritidis	79	59	83	52	63	42	61	81	75	69	61	49
Salmonella Hvittingfoss						26						
Salmonella Hadar	31		10	17								
Salmonella Infantis	24	21			19				10			
Salmonella Newport	22	66					16	7		9	23	70
Salmonella Saintpaul		22										
Salmonella Agona			85	27	41	16	12	27	32		40	
Salmonella Poona			10				9					
Salmonella Virchow				15						11		
Salmonella Ohio					12							
Salmonella Abony						15						
Salmonella Stanley								8	5		12	
Salmonella Give										39		
Salmonella Reading												25
Salmonella Mikawasima												23
Other	153	122	93	90	103	85	75	81	80	98	86	127
Total	808	512	656	325	390	406	310	335	442	396	372	374
Country of acquisition not specified												
Number of cases	233	301	476	223	145	102	107	86	111	153	93	150
Total	3046	2945	3033	2768	2906	2352	2279	2258	2496	2576	2735	3129

Figure 5. *Yersinia enterocolitica* cases 1995–2008.

Yersinia

Yersinia enterocolitica

In 2008, the NIDR received 466 notifications of *Yersinia enterocolitica*, which is a 13% increase from the figures for 2007 (414 cases). In 2008, the incidence in the entire country was 9/100,000 population. The highest incidence rate was reported among over-75-year-olds (15/100,000). There is great regional variation in the number of *Yersinia enterocolitica* cases, with the highest incidence reported in the hospital district of Kainuu (27/100,000 population).

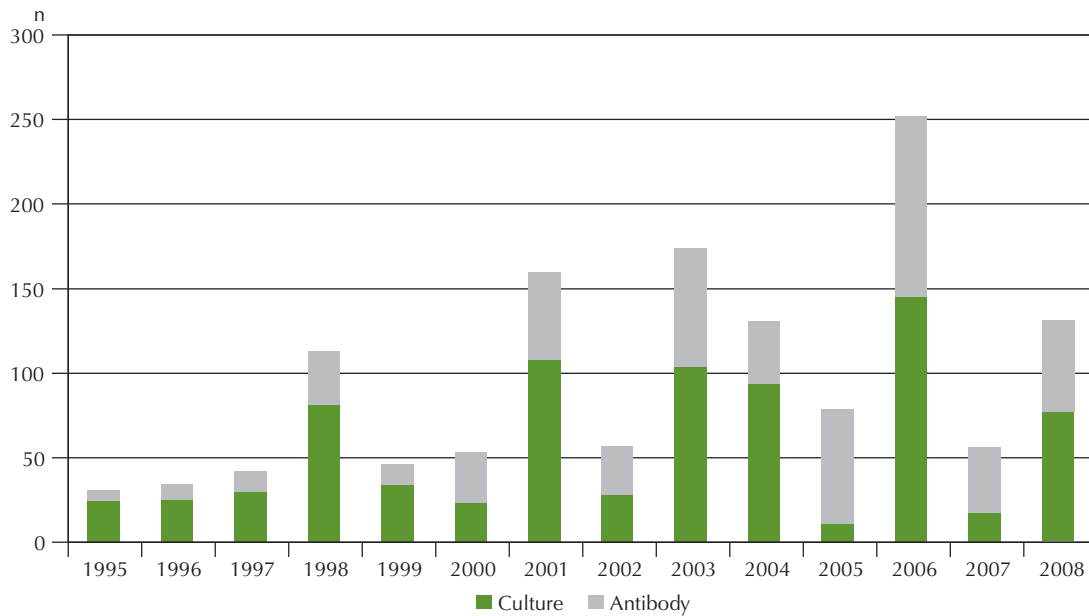
Yersinia pseudotuberculosis

The number of *Yersinia pseudotuberculosis* cases (132 cases) rose after the low figure (56) seen in 2007. No distinct trend can be seen in

the incidence of *Y. pseudotuberculosis* cases; in many years, outbreaks have caused great variation in the number of cases. In 2008, the incidence in the entire country was 2.5/100,000 population. The number of cases is too low to reliably indicate any regional variation. The outbreak in Kainuu can be seen in the high incidence rate for that hospital district, while no cases were diagnosed in nine of the hospital districts in 2008.

Shigella

In 2008, the incidence of shigellosis was 2.4/100,000. There were 124 reported cases, 52 in men and 72 in women. Incidence was highest among 25–49-year-olds (6.9). More than half of the cases (66) were diagnosed in the Helsinki and Uusimaa hospital district, where incidence was also higher than in

Figure 6. *Yersinia pseudotuberculosis* cases 1995–2008.

the other hospital districts (4.6/100,000). Six hospital districts had no diagnosed cases. Of the total, 113 infections were acquired abroad and three in Finland. In eight cases, the country of acquisition was not specified. The prevailing shigella species were *Shigella sonnei* (88 cases) and *S. flexneri* (23 cases). There were only four cases of *S. dysenteriae*. The leading countries of acquisition were India (25) and Egypt (21). Seventy-two per cent of the shigella strains were resistant to at least four antimicrobials, with 28% resistant to nalidixic acid and about 94% of these exhibiting impaired susceptibility to ciprofloxacin (MIC at least 0.125 mg/L). The nalidixic-acid-resistant strains were mainly acquired in India, as were the strains most resistant to ciprofloxacin (MIC at least 4 mg/L). Three shigella strains showed reduced susceptibility (I) to cefotaxime in disk

susceptibility testing; these strains, which represented *S. sonnei*, were acquired in Turkey.

Enterohaemorrhagic *Escherichia coli* (EHEC)

Eight microbiologically confirmed cases of enterohaemorrhagic *Escherichia coli* were reported to the NIDR (0.2/100,000/year). A few cases are diagnosed each year, most of which have been acquired abroad. In 2008, three cases were diagnosed in women and five in men. Five of the patients were under 15 years old, three of them 0–4-year-olds. None of the patients are known to have suffered from haemolytic-uremic syndrome as a complication. In four cases, the infection was acquired abroad.

Three of the cases were caused by the O157 serogroup strains, all of them

of foreign origin. Non-O157-serogroup strains caused four infections, three of them in one family.

Norovirus

In 2008, there were 2,574 reported cases of norovirus, 1,527 of them (59%) in women. The incidence rate, 49/100,000, was nearly as high as that for 2007. Over 80% of the cases were reported between January and May. More than half (55%) of the patients were over 75 years of age, with an incidence rate of 362/100,000, but infections were diagnosed in all age groups. The highest incidence rates were reported in the hospital districts of Keski-Pohjanmaa, Länsi-Pohja, and Kainuu.

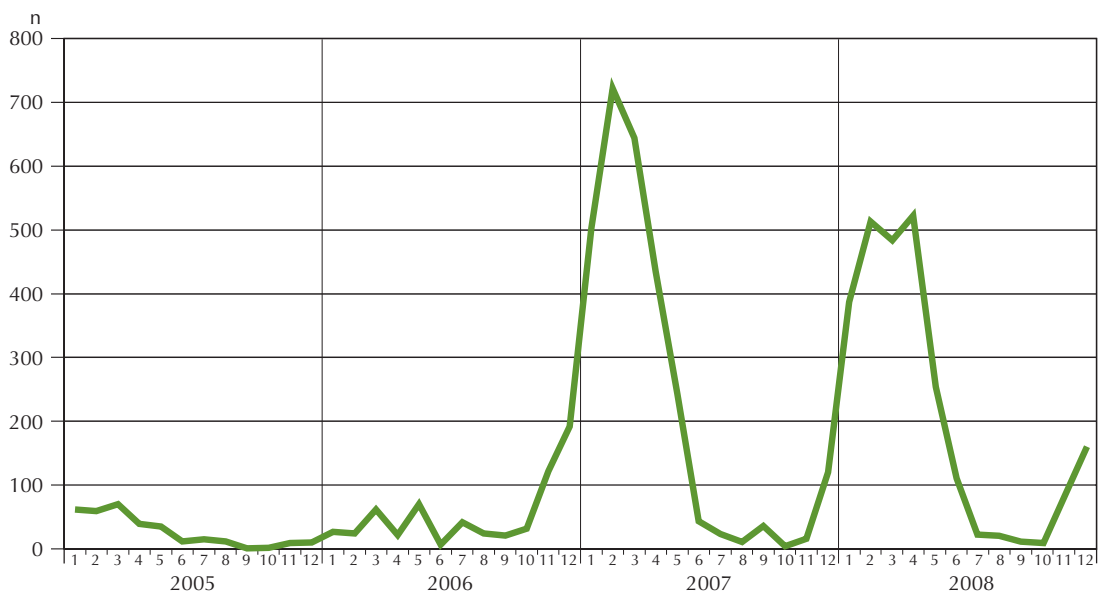
The accumulation of norovirus cases in the first part of the year was the result of a high number of outbreaks in

institutional settings. This also explains the high incidence among the elderly and the considerable regional variation. The main cause of these outbreaks was the GII.4 norovirus variant (GII4-2006b), which emerged in 2006. The other new norovirus variant, GII4-2006a, which also emerged in 2006, disappeared completely in 2008. In addition to the dominant variant GII4-2006b, some infections caused by the genotypes GII.7 and GI.3B were diagnosed throughout the year.

Rotavirus

In 2008, there were 1,337 reported rotavirus cases, with an incidence of 25/100,000. Of these cases, 740 were diagnosed in men and 597 in women. The number of cases was clearly higher than in 2007, when the number of cases

Figure 7. Norovirus cases by month, 2005–2008.



saw a record low. The monthly variation of incidence rates followed the normal pattern: the number of cases increased over the spring, peaking in April, and decreased in June–July. The incidence was clearly highest in children under five years of age (424/100,000). They constituted 90% of all cases. Cases were reported from all hospital districts, with the highest incidence seen in the hospital district of Kainuu (75/100,000). These are interesting times with regard to rotavirus, as the first rotavirus vaccine was launched in Finland in the summer of 2006. At first, the vaccine was used sporadically, but its use increased vigorously in 2007. A decision has been made to add the children's rotavirus vaccine to the national vaccination programme. As of September 2009, the vaccine will be available free of charge from healthy baby clinics to children six weeks of age or older.

Enterovirus

In 2008, there were 352 reported cases of enterovirus. Of the patients, 209 were men and 143 women. More than half (58%) of the patients were under nine years of age, but infections were diagnosed in all age groups.

Most of the year's enterovirus diagnoses were made in the last quarter of 2008. Roughly 88% of the cases occurred in September–October, when an unusually extensive hand, foot, and mouth epidemic broke out in Finland. During the outbreak, several adults were also infected with the disease, exhibiting strong symptoms. The hand, foot, and mouth disease

outbreaks were caused by two poorly known coxsackie viruses, CAV-6 and CAV-10. There was an exceptional symptom associated with the epidemic: several patients lost nails.

Listeria

Thirty-nine *Listeria monocytogenes* infections were reported in 2008. Of these patients, 54% were women and 74% were 65 years of age or older. The annual incidence of listeriosis was 7.4 cases per million population. There were 33 blood findings (77%) and three CSF findings. One finding was obtained from both blood and CSF, and two from other puncture samples. Three patients died. None of the cases were associated with pregnancy, and only one of the patients was a child. Listeriosis was diagnosed in most hospital districts, with the number of cases ranging from zero to 13; in six of the hospital districts, no cases were diagnosed. Serotype 1/2a accounted for 60% of the infections, and serotype 4b for 33%.

In 2008, two infection clusters were detected that were caused by genetically similar *Listeria monocytogenes* types. One of these included five cases and the other one eight. The source of infection of the first cluster remained unclear, and the epidemiological investigation of the second cluster is still in progress at the time of writing.

Food- and water-borne outbreaks

In 2008, the National Public Health Institute received 80 notifications

of suspected food- or water-borne outbreaks. These included a *Yersinia pseudotuberculosis* outbreak in Kainuu, where the infection spread through carrots, as well as an extensive *Cryptosporidium parvum* outbreak in Helsinki diagnosed in Finland for the first time. Several other intestinal infection clusters were investigated as well.

Cryptosporidium parvum outbreak in Helsinki

Seventy-two people who had eaten at the staff canteen of the Helsinki Public Works Department fell ill between 30 October and 14 November 2008 with diarrhoea caused by *Cryptosporidium parvum*. In addition to diarrhoea, patients suffered from severe abdominal pain and nausea. The source of infection was investigated through a questionnaire and extensive tracing. Lettuce of foreign origin was suspected as the source of infection, but no confirmation was received during the investigation.

Campylobacter outbreak in Korpilahti

At the end of July, tens of people fell ill with gastroenteritis in Korpilahti as a result of *Campylobacter jejuni*. In further investigation, small numbers of indicator bacteria were found in the samples taken from the water intake, but no campylobacter was found. Apart from water for household consumption, there were no other common factors among the patients, so drinking water was considered the likely source of infection.

Salmonella Mikawasima outbreaks in February and in November

Nine *Salmonella* Mikawasima infections were diagnosed in Southern and Western Finland in February. All strains represented genotype SMIK5. Mikawasima is a rare serotype in Finland. However, small clusters caused by it are diagnosed almost yearly, as seen in, for example, 2006 and 2007. The second *Salmonella* Mikawasima cluster of 2008 was observed in November, when an infection caused by the SMIK3 genotype was diagnosed in 15 patients. These patients were cruise ship staff, and only two of them displayed symptoms of contracting salmonella. The other cases were diagnosed when the personnel underwent extensive testing for salmonella. The source of infection could not be identified in further investigation. No cases were diagnosed among the passengers.

Salmonella Poona outbreak

From the end of April to the end of June, 16 cases of *Salmonella* Poona were diagnosed, all over Finland. The strains represented four different DNA profiles, although the majority (10 strains) was identical in DNA profile. Some of the strains were separated by a 4–9 DNA fragment. Therefore, some strains should not have been considered part of the same outbreak, according to internationally accepted practice. However, since *S. Poona* is a rare serotype in Finland (e.g., in 2007, no domestic cases were diagnosed) and all Poona findings in 2008 (apart from one case in October) were made in a short period of

time, the infections were judged to have had a common source. Poona is a rare serotype in other European countries as well. Individual *S. Poona* cases occurred more than usual in some other European countries also between April and June. In Scotland, five cases were diagnosed that had an identical genotype to the *S. Poona* seen in Finland. The Finnish patients were interviewed, but no common predisposing factor was found.

Salmonella Newport and *Salmonella* Reading outbreaks

From mid-October to the end of November, more than 70 cases of *Salmonella* Newport and almost 30 cases of *Salmonella* Reading were diagnosed, all over Finland. Both serotypes are rare in Finland. No increase in the number of cases was detected elsewhere in Europe. Some of the infections occurred in clusters in Helsinki, Tuusniemi, Rovaniemi, and Kymenlaakso. In all cases, the common factor was institutional eating. The source of infection was investigated by interviewing the patients and the treatment personnel, by tracing food delivered to the institutional kitchens, and via a case-control study, but the source has not been detected so far.

Salmonella Anatum outbreak

Seven cases of *Salmonella* Anatum were diagnosed in the Joensuu region from mid-August to the end of October. The strain, representing genotype SANT9, was susceptible to tested antimicrobials. The same Anatum type has been diagnosed in patients in Finland periodically since 2006. The

DNA profiles of the strains isolated from humans are different from the DNA profiles of Anatum strains isolated from animals and food by the Finnish Food Safety Authority (Evira).

Salmonella Enteritidis outbreak in a spa in Estonia

In August, *Salmonella* Enteritidis FT 14b, genotype SENT1 caused an epidemic in a spa in Estonia. There were 25 microbiologically confirmed salmonella infections diagnosed in Finns visiting the spa.

Yersinia pseudotuberculosis outbreak in Kajaani and Oulu

From the end of June, more than 30 cases of gastroenteritis caused by *Yersinia pseudotuberculosis* bacteria were diagnosed in the hospital district of Kainuu. Symptoms included severe abdominal pain, fever, and diarrhoea. Most patients started suffering from these symptoms in June–July. Some of the patients suffered from complications, such as erythema nodosum or reactive arthritis. There were 38 culture-confirmed cases diagnosed in Kajaani and 11 in Oulu between 22 June and 11 August 2008. The majority of the diagnoses were in working-age men. It is suspected that the epidemic broke out from contaminated carrots that were served in several institutional kitchens in the Kajaani and Oulu regions. *Y. pseudotuberculosis* O:1 bacteria with identical genotype were found in both patient and carrot samples.

HEPATITIS

Hepatitis A

In 2008, the NIDR received 21 notifications of hepatitis A (incidence: 0,4/100,000), which is the same figure as in the previous years. Ten patients were men, and 11 were women. Most cases (9) were diagnosed in the hospital district of Helsinki and Uusimaa, while 12 hospital districts had no diagnosed cases. Twelve infections were acquired abroad and three in Finland. In eight cases, the country of acquisition was not specified.

The incidence of hepatitis A has remained low following the epidemics among injecting drug users in 2002–2003, possibly because of vaccinations targeted at risk groups and tourists. The family of a hepatitis A patient must always be protected by gamma globulin or via vaccination.

Hepatitis B

In 2008, there were 46 cases of recent hepatitis B (acute hepatitis B infection) reported, which is a little higher than the previous year's figure, but this is still considerably lower than the level of the peak years in the 1990s. There is little variation in incidence rates between hospital districts.

Thirty-three patients were men, and 13 were women. It seems that including hepatitis B vaccinations in the general vaccination programme for risk groups, as well as the health counselling and

adverse effect prevention work targeted at injecting drug users, still are keeping the number of cases low (Figure 8, Table 2). As in the previous year, only one case of acute hepatitis B associated with injecting drug use was diagnosed in 2008.

Hepatitis C

The slow drop in the number of newly diagnosed hepatitis C cases has been the trend of the past decade. This trend continued in 2007, although there was some regional variation. It is difficult to separate acute hepatitis C infections from infections acquired years earlier, which is why any changes in the figures should be interpreted cautiously. The frequency of hepatitis C is so high among injecting drug users that changes in frequency are very slow, even if the risks were well under control.

According to reports, most hepatitis C cases are related to injecting drugs (Table 3). The number of these cases has decreased in the 2000s (928 cases in 2000 and 508 in 2008). The number of HCV and HBV cases wherein the mode of transmission remains unknown is large (513 cases in 2008). In general, these HCV cases are considered to be related to injecting drug use because HCV is not transmitted easily through sexual contact and no community transmission has been detected. However, the yearly number of unclear cases is surprisingly high and the underlying hidden risk factors should be investigated further.

Figure 8. Acute Hepatitis B cases injecting drugs and sexually transmitted infections, 1998–2008.

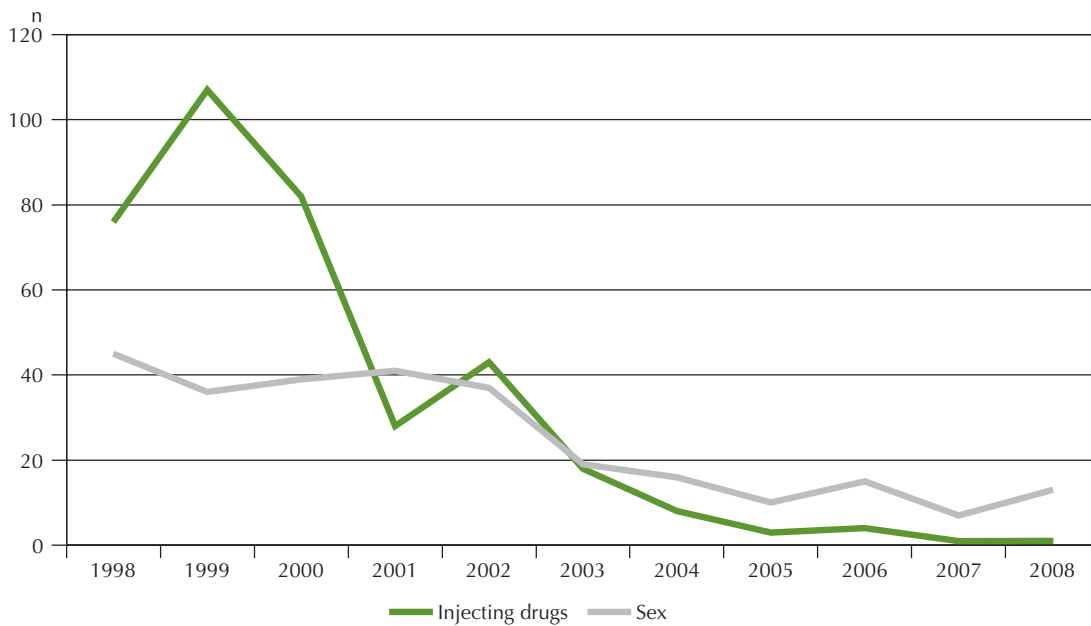


Table 2. Acute Hepatitis B cases by mode of transmission from physician notifications, 1998–2008 *)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Injecting drugs	76	107	82	28	43	18	8	3	4	1	1
Sex	45	36	39	41	37	19	16	10	15	7	13
Perinatal	1	1	1	-	1	1	-	-	-	-	-
Blood products	4	1	1	1	1	-	3	-	-	-	-
Other	4	9	8	6	2	1	4	3	2	1	2
Unknown	116	103	109	51	93	67	28	18	16	14	29
Total	246	258	240	127	177	106	59	34	37	23	45

Table 3. Hepatitis C cases by mode of transmission from physician notifications, 1998–2008 *)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Injecting drugs	1047	1001	928	822	710	627	603	621	571	416	508
Sex	55	35	41	42	45	46	59	61	70	63	68
Perinatal	4	10	6	3	3	1	10	5	8	4	9
Blood products	27	23	25	19	18	22	18	24	7	17	15
Other	24	40	31	31	28	34	31	35	37	23	31
Unknown	646	643	708	574	567	533	517	497	486	634	513
Total	1803	1753	1739	1492	1372	1264	1238	1244	1181	1157	1144

*) Between 1995–2003 four HBV-cases have been notified to have been transmitted by Finnish blood products. Since 2000 no cases of HCV transmitted by Finnish blood products have been notified. The surveillance for the mechanism of transmission for HCV was started in 1998.

With regard to age groups, the number of HCV cases among 15–19-year-olds has fallen to less than half since 2002 (Figure 9). There are signs of a decline among 20–24-year-olds as well. In older age groups, the number of cases has fallen less dramatically. This may suggest that the health counselling and harm reduction targeted at injecting drug users have been so successful in infection risk prevention that an HCV infection is acquired later in life than before if the drug use continues for a long time. It seems that the health counselling provided for injecting drug users and the harm reduction has had its best results in the youngest age groups, which was one of the main goals.

As regards regional patterns, the incidence of HCV has decreased in the provinces of Western, Eastern,

and Southern Finland. The situation is starting to cause concern in the province of Oulu, where the incidence rate has increased almost non-stop since 1995. In 2008, there were 129 new HCV cases diagnosed in the Pohjois-Pirkanmaa hospital district (Figure 10), and the reasons for this growth should be investigated. The growth could be explained in part by testing that is more active than in the rest of Finland, but the increase in the number of cases in the past few years in particular has been quite clear.

Because of the high incidence in Northern Finland, situations where injecting drug users use drugs in the region should be investigated and, if necessary, health counselling for injecting drug users should be increased to curb the infection rates.

Figure 9. Hepatitis C cases by age, 1998–2008.

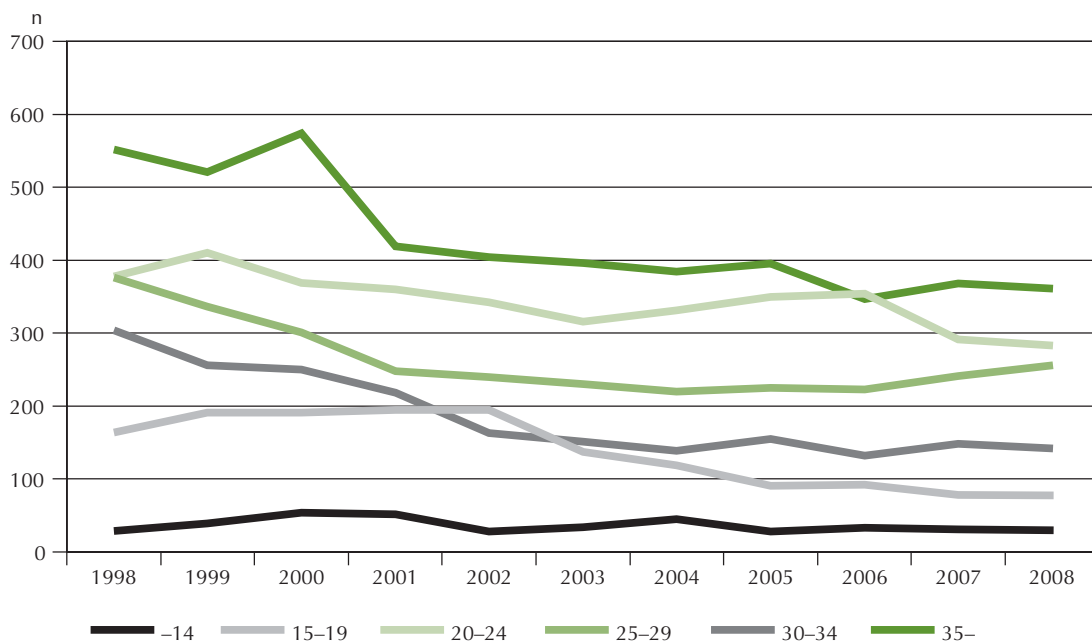
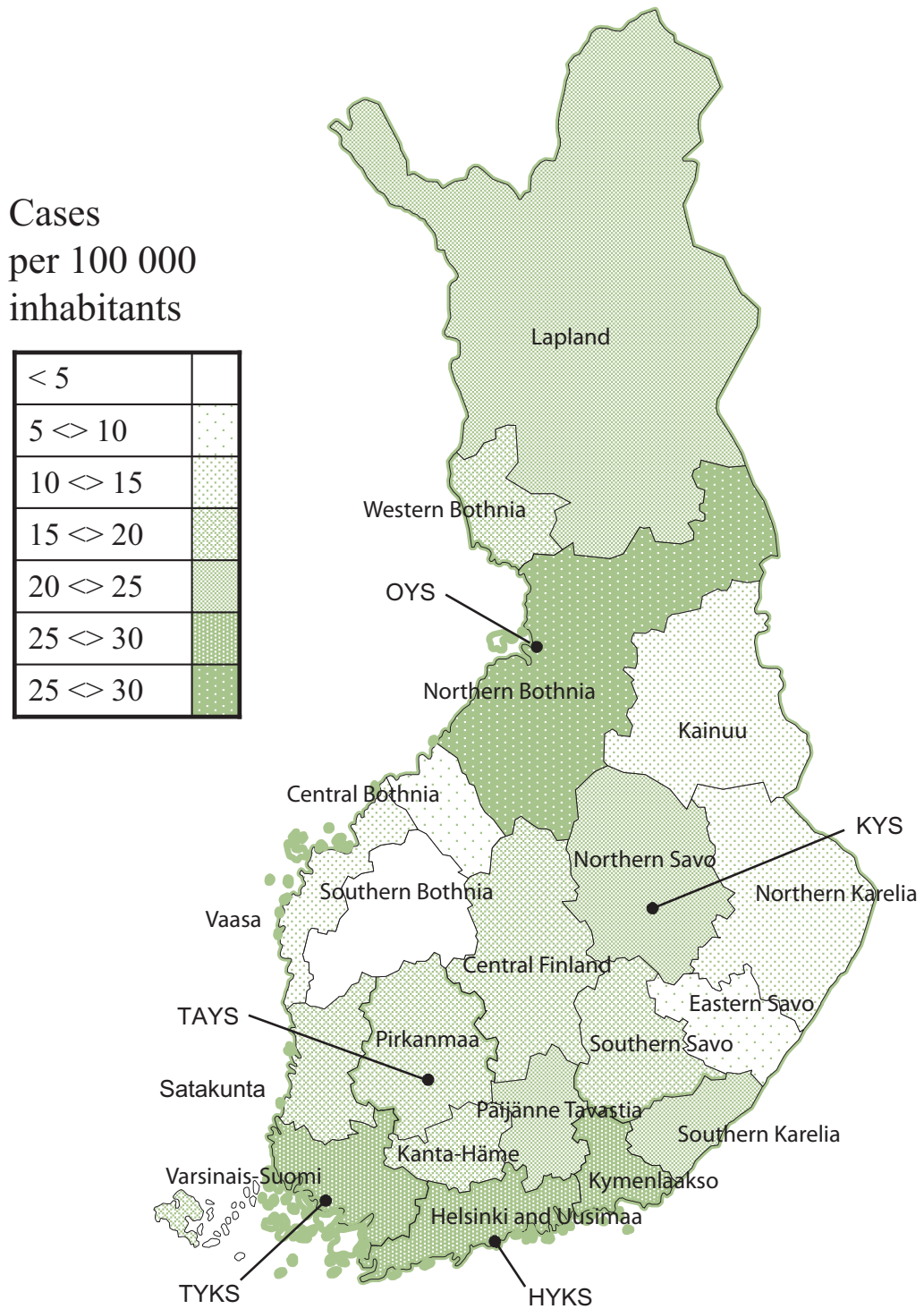


Figure 10. Incidence of Hepatitis C in Finland 2008 by hospital district.



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SEXUALLY TRANSMITTED DISEASES

Chlamydia

(*Chlamydia trachomatis*)

In 2008, the number of chlamydia cases reported to the NIDR totalled 13,871, which is nearly equal to the figure for 2007 (13,973). The incidence rate was 266/100,000. The highest incidence of chlamydia cases was detected in the hospital districts of Lappi (441/100,000), Helsinki and Uusimaa (302/100,000), and Pirkanmaa (296/100,000). About 59% of the patients were women. The majority of the cases were diagnosed in 15–24-year-old women (73%) and 20–24-year-old men (65%). As previously, among under-20-year-olds, women constituted a significantly larger group of patients (2,779) than men did (797).

Gonorrhoea

(*Neisseria gonorrhoeae*)

The number of gonorrhoea cases remained nearly the same as in the previous year. The NIDR received 202 notifications of gonorrhoea. The incidence rate was 3.8/100,000. Seventy-nine per cent of the patients affected were men. The majority of cases (76%) were diagnosed among 20–49-year-olds. The country of acquisition was specified in 76% of the cases. More than 53% of the infections in men were contracted abroad. In 33 cases, the infection was acquired in the Far East (26%). Six cases in women were contracted abroad (14%).

Figure 11. Chlamydia by age groups in young adults, 1995–2008.

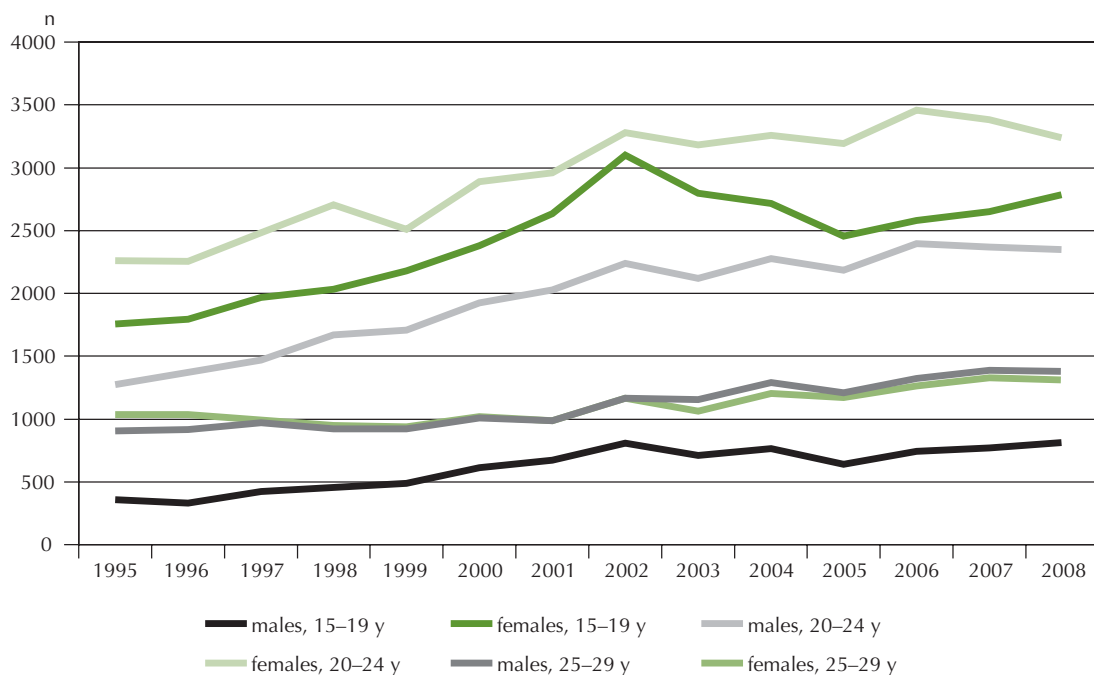


Table 4. Gonorrhoea infections acquired domestically and abroad, 1995–2008.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Domestically acquired infections	185	83	94	100	108	129	113	100	89	133	133	112	79	80
Russia	70	50	42	49	42	48	34	28	9	7	23	12	6	16
Estonia	26	9	7	9	8	7	3	5	2	6	1		2	
Thailand	9	9	7	16	19	18	17	31	27	38	30	42	44	34
Muu maa	25	20	19	24	16	32	26	18	21	21	20	25	21	23
Place of acquisition unknown	63	55	49	71	62	50	54	53	41	47	33	45	42	49
Total	378	226	218	269	255	284	247	235	189	252	240	236	195	202

Table 5. Syphilis infection acquired domestically and abroad, 1995–2008.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Domestically acquired infections	48	53	50	46	21	54	32	24	30	22	25	20	54	58
Russia	49	57	48	33	43	80	49	22	18	16	22	17	16	24
Estonia	5	11	5	5	3	3	2	1	6	1	6	3	4	9
Somalia		1	2	5	2		1	2	2		3	3	4	6
Thailand	1		1	4		1	1		1	2	1	1	2	6
Muu maa	9	12	14	13	14	17	11	12	14	12	16	17	21	30
Place of acquisition unknown	56	85	52	81	57	49	63	67	62	57	69	70	83	82
Total	168	219	172	187	140	204	159	128	133	110	143	131	188	215

Syphilis (*Treponema pallidum*)

There were 215 syphilis cases reported in 2008. The figure was slightly higher than in 2007 (184). The incidence rate was 4.1/100,000. Sixty-four per cent of the cases were diagnosed in men. Sixty-one per cent of all cases were diagnosed in 25–49-year-olds. The incidence was greatest in the hospital districts of Etelä-Karjala (10.1/100,000), Helsinki and Uusimaa (8.7/100,000), and Kymenlaakso (5.0/100,000). As in the previous year, several cases of syphilis were diagnosed in men in the hospital district of Helsinki and Uusimaa (incidence rate: 11.6/100,000). The country of acquisition was specified

in 68% of men's infections, and of these cases 46% were acquired abroad, most often in Russia (8). The country of acquisition was identified in 51% of women's infections. Seven women had acquired the infection in Finland and 32 abroad, most often in Russia.

HIV infection

In 2008, the number of newly diagnosed HIV cases decreased when compared with the two previous years. There were 148 newly diagnosed cases, 86 of them in Finns. Of the infections, 103 were sexually transmitted, 72 of them in men. The biggest decrease was detected for cases related to sexual transmission between men, although

it is still too early to tell whether this is a transitory phenomenon. Evaluation is difficult because, in Finland, there is no researched information available on the risks of sexually transmitted diseases related to sexual behaviour or getting tested for HIV. However, on the positive side, as regards diagnosed cases, Finland has moved in a different direction than the rest of Europe, at least in 2008. The number of HIV cases transmitted through injecting drug use has continued to drop, and there were six cases reported for this risk group, of which only two were diagnosed in Finns.

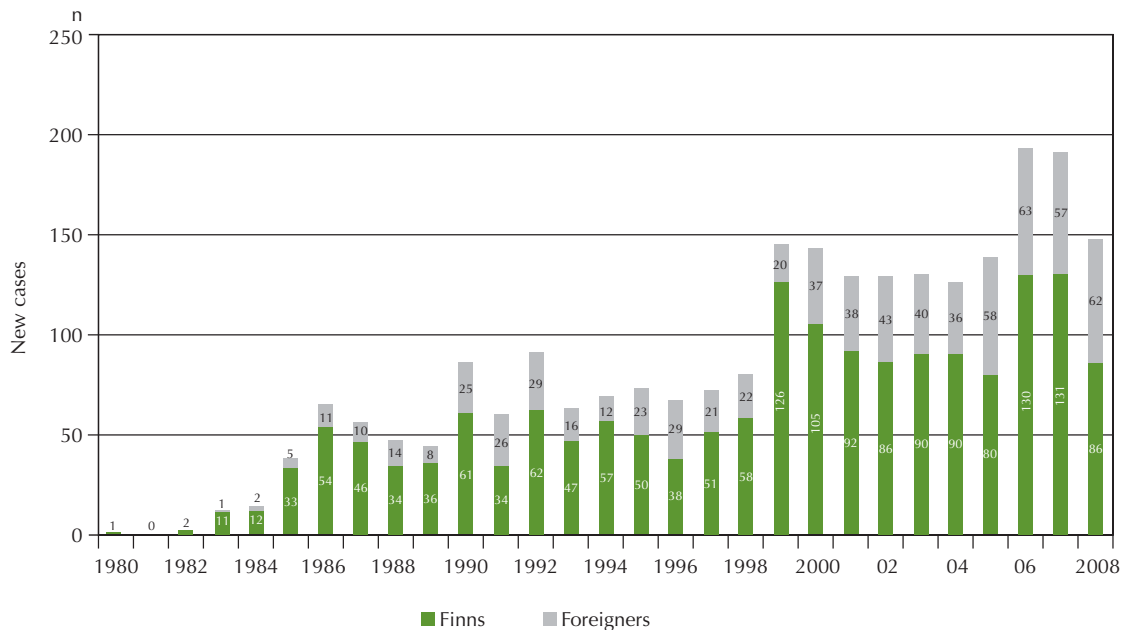
Although it seems that the total number of HIV cases has decreased since the peak years, the number of cases related to heterosexual contact has decreased less than that of cases related to homosexual contact, and, in 2008, almost half of the cases related to sexual contact among Finns were transmitted through heterosexual

contact. This may be a sign of still not realising the importance of safe sex or not understanding that everyone is at risk. The breakdown of cases by gender did not change from the preceding years.

Travel-related risks are still considerable. At least half of the infections contracted by Finns were probably acquired abroad. Subtype determination indicates that the proportion may be even greater than this. In 2008, subtype determination could be done in 116 cases. Almost half of these represented subtype B, which is the prevailing type in the homosexual contact group in particular. The next most common subtypes were CRF01-AE and CRF06-cpx, common in South-east Asia and Estonia.

There were no significant changes in the number of AIDS cases or in AIDS mortality. There are not many cases, but there are still too many, given that deaths are completely preventable through early diagnosis

Figure 12. Hiv cases detected among immigrants and Finns 1980–2008.



ANTIMICROBIAL RESISTANCE

MRSA

In 2008, the situation with methicillin-resistant *Staphylococcus aureus* (MRSA) worsened. More than 1,700 MRSA infections were reported to the Infectious Diseases Register (1,285–1,317 in 2006–2007). Nearly a fifth (19%, or 337/1,740) was diagnosed from samples taken from the nose or the nostrils. The proportion was higher than in 2006–2007 (12–14%) and almost as great as in 2004 (22%), when the MRSA situation worsened for the last time, reflecting high screening activity. There were 38 cases of MRSA isolated from the blood (in 2006–2007, there were 32–36 cases) and one from CSF. Sixteen (42%) MRSA findings in blood were made in the Pirkanmaa hospital district (3.4/100,000) and 10 (26%) in the Helsinki and Uusimaa

hospital district (0.7/100,000). The other hospital districts reported one to three cases each, totalling 12.

As earlier, the hospital district of Helsinki and Uusimaa and that of Pirkanmaa reported the highest total figures. However, the incidence per 100,000 population was highest in the hospital districts of Länsi-Pohja, Pirkanmaa, and Pohjois-Karjala. As earlier, the majority of the patients were over 75 years of age. The number of children's MRSA infections increased a bit (58–83), but the proportion remained at less than five per cent.

In 2008, an MRSA strain was typed in over 1,750 individuals. About 30% of the MRSA cases represented type FIN-16, which has been the prevailing strain type in Finland for four years in a row. The number of FIN-16 strains grew 25%

Figure 13a. MRSA cases by hospital district, 1995–2008.

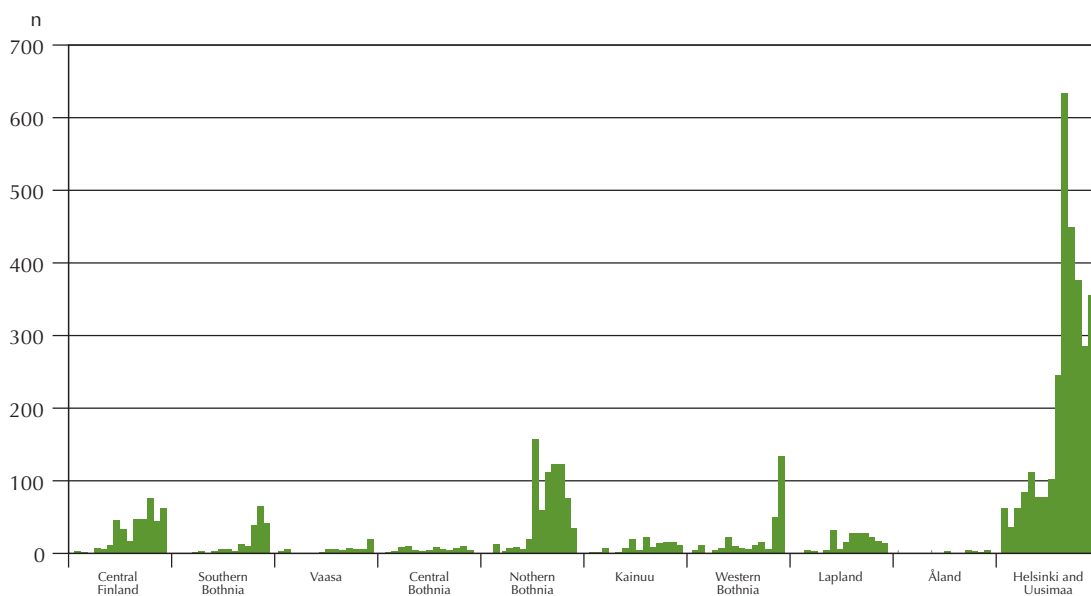
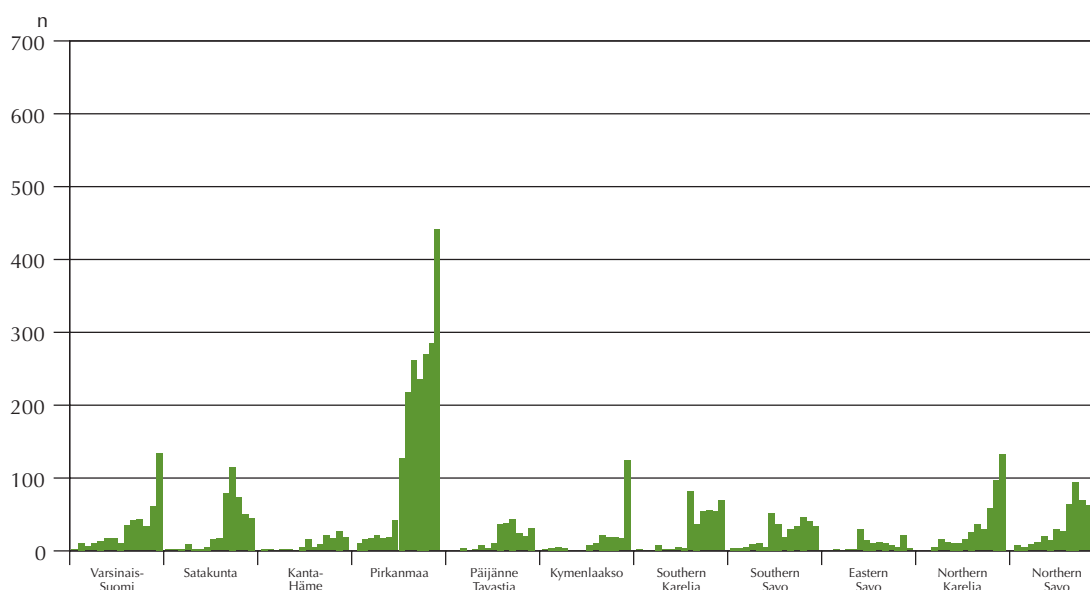


Figure 13b. MRSA cases by hospital district, 1995–2008.



from the previous year's level. The majority (78%) of the FIN-16 strains were diagnosed in Pirkanmaa, with the rest spread among 13 different hospital districts. Other common strains diagnosed in several hospital districts included FIN-10, FIN-4, FIN-12, and FIN-7. In comparison with the 2007 figure, the number

of FIN-12 strains nearly tripled, the number for FIN-10 grew to be 2.5 times as high, and the number of FIN-4 strains grew by about 1.4 times. The number of FIN-7 strains fell. There were one or two prevailing strains in the hospital districts with the highest incidence: FIN-10 in the hospital district of Länsi-Pohja, FIN-16

 Table 6. MRSA-findings and their proportion of *Staphylococcus aureus* blood culture findings in 1995–2008.

Year	All MRSA-findings	<i>S. aureus</i> –findings from blood	MRSA-findings in blood and their proportion of all <i>S. aureus</i> (%)
1995	89	627	2 (0,3)
1996	109	667	0 (0)
1997	120	746	4 (0,5)
1998	189	717	5 (0,7)
1999	211	812	8 (1,0)
2000	261	850	4 (0,5)
2001	340	887	4 (0,5)
2002	601	988	10 (0,9)
2003	859	979	7 (0,7)
2004	1474	1059	33 (3,1)
2005	1379	1013	27 (2,7)
2006	1325	1239	37 (3,0)
2007	1291	1178	32 (2,7)
2008	1739	1259	38 (3,0)
Total	9987	13021	211 (1,6)

in Pirkanmaa, and FIN-3 and FIN-3b in Pohjois-Karjala. An MRSA strain isolated from the blood was typed in 31 individuals. More than half of these were type FIN-16, and the rest represented 10 other strain types. About 60% of the MRSA strains in patients 70 years of age or older represented either type FIN-16 or FIN-10. About 66% of the MRSA strains in patients under 15 years of age were type FIN-4, type FIN-12, or unique. More than 200 strains were tested for the PVL gene; these either had been isolated from deep foci of infection or represented a strain type that might indicate the presence of PVL genes. Seventy-one strains were found to be PVL-positive, and the prevailing strain types were FIN-25, FIN-11, FIN-5b, and FIN-36.

VRE

In 2008, the number of vancomycin-resistant enterococcus (VRE) findings reported to the NIDR decreased from the previous year's figure. Most of the findings (24/44) were made in the hospital district of Pohjois-Pohjanmaa in patients 65 years of age or older. In other hospital districts ($n=9$), the number of findings varied from one to six. One VRE case was detected via the blood and none through CSF.

In 2008, VRE was typed in 39 individuals. Over 70% (28/39) of the findings represented the *E. faecium* species and the vanB type. About half of the findings (19/39) were unique findings or individual based on PFGE, and about 40% (16/39) represented the VRE IV strain detected in previous years. The rest ($n=4$) were individual previously

identified VRE epidemic strain types. Apart from one, all VRE IV strains and about one third of unique VRE strains were diagnosed in Pohjois-Pohjanmaa.

ESBL

Since the beginning of 2008, third-generation *Escherichia coli* and *Klebsiella pneumoniae* exhibiting reduced susceptibility to cephalosporin (I, intermediate) or showing resistance to cephalosporin (R, resistant) have been reported to the NIDR. The majority of these bacteria are enzyme-producing ESBL strains and extended-spectrum cephalosporins that split penicillin. In 2008, the majority of ESBL bacteria were *E. coli* (1,707) and a small proportion *Klebsiella pneumoniae* (111).

ESBL in *E. coli* was diagnosed in all age groups – almost 80% in women and over half from patients aged 65 years or more. The majority of cases (88%, or 1,319/1,707) were diagnosed from the urine. Both the number of cases and the incidence were highest in the hospital district of Helsinki and Uusimaa (almost 900 cases, 61/100,000).

Forty-two findings were made from the blood, the majority of them in the Helsinki and Uusimaa hospital district. However, the incidence in blood findings was highest in the hospital districts of Länsi-Pohja, Päijät-Häme, and Satakunta.

Over half of the ESBL cases reported that involved *K. pneumoniae* were also diagnosed in patients aged 65 years or more, but the proportion of women was smaller, at 60%. The majority of diagnoses (64%, 71/111) were made

from urine. The number of cases was the highest in the hospital district of Helsinki and Uusimaa (47/111), but the incidence was highest in the hospital districts of Central Finland and Satakunta. Four findings were made from the blood (4/418, 0.1%).

In 2008, genes encoding extended-spectrum beta-lactamases were specified in 158 bacterial strains. The strains had been collected for epidemic control, research, and confirmation of third-generation cephalosporin-resistance. The figure includes 130 *E. coli* and nine *K. pneumoniae* strains. From the *E. coli* strains isolated in 2008, 95% had an extended-spectrum beta-lactamase of the CTX-M group. The CTX-M gene breakdown was as follows: 60% had a CTX-M-1 group ESBL gene, 39% had a CTX-M-9 group ESBL gene, and one per cent had a CTX-M-2 group ESBL gene. All *K. pneumoniae* strains studied had an extended-spectrum beta-lactamase of some CTX-M group, with the CTX-M-1 group being the most common. The whole gene sequence, or sequence of bases, was specified for some of the CTX-M genes. The sequencing of CTX-M genes indicated that the CTX-M-15 gene, which is common elsewhere in Europe, is found in Finland as well.

Invasive pneumococcal disease (*Streptococcus pneumoniae*)

There were a record of 924 cases (17/100,000) of invasive pneumococcal disease reported in 2008. The incidence rose from the previous years' levels (2006–2007: 14–15/100,000), and, as earlier, incidence rates were considerably higher

in men than in women (20/100,000 v. 15/100,000). Regional variation was significant (13–50/100,000), which may be due to differences in how actively samples were taken.

The serotype breakdown of invasive pneumococcus strains did not change from that of 2007. The prevailing serotype 14 still covered a fifth of all typed strains.

In 2008, the antimicrobial-susceptibility of 930 pneumococcal strains isolated from invasive infections was analysed. Compared with 2007, 2008 saw the proportion of strains with impaired susceptibility to penicillin (MIC \geq 0.125 μ g/ml) increase slightly. The proportion of resistant strains (MIC \geq 2 mg/L) was three per cent, and 15% of the strains had reduced susceptibility (I, intermediate) to penicillin. The proportion of macrolide-resistant strains has also increased slightly; 25% of invasive pneumococcal strains were resistant to erythromycin. The proportion of multiresistant (PEN-ERY-TET) strains was 3.4%, which is slightly lower than in 2007. In 2008, one levofloxacin-resistant (MIC \geq 8 mg/L) and two ceftriaxone-resistant (MIC \geq 2 mg/L) strains were detected. In general, the changes in the susceptibility of invasive pneumococcus strains were minor when compared with 2007 findings.

Clostridium difficile

Clostridium difficile has been a finding reportable to the NIDR from the beginning of 2008. Over 8,000 cases were reported, of which 6,275 (118/100,000) were of a toxin-producing strain. Almost 60% of patients diagnosed with *C. difficile*

Table 7. Antimicrobial resistance of *Streptococcus pneumoniae* findings in blood and CSF, 1998–2008.

Year	Cases notified to NIDR	Strains examined	Erythromycin (%)	Penicillin (I+R) (%)	Multidrug resistance (%)
1998	561	84	3,6	0	0
1999	568	471	5,9	7,2	0
2000	601	439	8	3,7	1,4
2001	658	360	18,8	7,5	5
2002	599	594	16,3	8	3,7
2003	721	739	21,9	12,7	5,7
2004	748	748	20,5	9,6	3,7
2005	735	731	20,5	9,6	4,4
2006	741	760	27,9	16,4	5,4
2007	788	794	23,2	14,4	3,5
2008	924	930	24,5	17,7	3,4

I – reduced susceptibility; R – resistant; Multidrug resistance – strains simultaneously resistant to penicillin, erythromycin and tetracycline.

were women, and half were 75 years of age or older. There was significant regional variation in the incidence rate (57–189/100,000), with the hospital districts of Lappi, Varsinais-Suomi, and Satakunta showing the highest incidence. Over 200 (3%) cases of toxin-positive strains were reported in under-15-year-olds, and almost 80 of these had been isolated in infants under 12 months old. There were abundant positive findings in infants in a few hospital districts, and when these cases were investigated further, it was observed that the majority were of patients treated at the outpatient clinic; in their case, a positive sample did not lead to treatment or further procedures. In both adults and children, a *C. difficile* sample should primarily be taken from patients suffering from diarrhoea (a stool sample), and a patient who has suffered from *C. difficile* before should not be automatically tested for *C. difficile* if the symptoms have not recurred. Naturally, in infants, evaluating the situation on the basis of diarrhoea symptoms may be difficult.

In severe cases or when a local outbreak is suspected, clinical laboratories have been asked to send *C. difficile* strains for further examination by the THL reference laboratory. The criteria for sending strains for further study are based on European specifications that are now in their draft stage. The number of strains sent varied by region: although all hospital districts reported toxin-positive *C. difficile* cases, only 13 of them sent strains for genotyping. These came to less than 10% of the cases reported to the NIDR. A third of the strains studied represented PCR ribotype 027, which has been diagnosed in seven hospital districts so far: Helsinki and Uusimaa, Varsinais-Suomi, Kymenlaakso, Satakunta, Etelä-Karjala, Pirkanmaa, and Kanta-Häme. Other PCR ribotypes than 027 also caused severe cases of *C. difficile*. In addition to PCR ribotype 027, other ribotypes were detected that may be possible hyper-producers of toxin. So far, more than 70 different PCR ribotypes have been detected in Finland, of which about 30 have been identified as genotypes previously reported internationally.

MYCOBACTERIAL INFECTIONS

Tuberculosis – *Mycobacterium tuberculosis*

In 2007, Finland introduced the case definitions of the European Union's infectious disease surveillance, and, at the beginning of 2008, the method for calculating numbers of tuberculosis cases was changed in order to make the compilation of statistics on recurring tuberculosis cases more effective. Consequently, the number of tuberculosis cases recorded increased to a slightly higher level than in the preceding years. In 2008, tuberculosis treatment outcome surveillance based on international specifications was launched. The first reports will be included in the next annual report, to be published in 2010. Because of the complementary data that will improve the quality of register data regarding cases in outcome surveillance, there will be small changes in the number of cases reported to the NIDR for two to three years after the calendar year in which the case was first registered.

In 1995–2006, the registered tuberculosis cases included all cases confirmed by culture, as reported by the laboratories. In addition, cases reported by a physician were included only if the diagnosis was based on histology or a case of pulmonary tuberculosis was confirmed by positive sputum staining for tuberculosis bacilli. From 2007 onwards, the statistics include all cases wherein a physician suspected tuberculosis on the basis of clinical evidence and decided to give full tuberculosis treatment although the infection was not confirmed by

microbiological tests or histology. The new grounds for compiling statistics do not affect the number of cases based on the results of laboratory tests or histology.

Calculated with these new grounds, there were 346 cases of tuberculosis in 2008, which is a six per cent increase from the figure for 2007 (327). The incidence of tuberculosis was 6.5/100,000. In 2008, there were 249 cases of tuberculosis confirmed by culture, which is two per cent more than in 2007 (245). As judged by physicians' notifications, 23 patients (7%) had a previous history of tuberculosis diagnosed after 1950, when anti-tuberculosis medication became available.

Four of the reported cases (1%) were diagnosed in under-15-year-olds, 36 (10%) in those aged 15 to 29 years, 33 (10%) in 30–44-year-olds, 67 (19%) in 45–59-year-olds, 91 (26%) in 60–74-year-olds, and 115 (33%) in people 75 or older.

In 2008, 51 of all reported cases of tuberculosis (15%) were diagnosed in patients who were born abroad or were citizens of other countries. Two (4%) of them were under 15 years of age, and 40 (78%) were 15–44 years old. Thirty-one cases (61%) were of pulmonary tuberculosis, and 22 (39%) presented other forms of tuberculosis.

The susceptibility of *Mycobacterium tuberculosis* strains remained good. In 2008, one multiresistant (MDR, resistant at least to isoniazid and rifampicin) *M. tuberculosis* strain was detected.

In six (2%) of the tuberculosis cases reported in 2008, the patient also had an HIV

infection. In all six of these cases, the HIV infection was reported as a new case in 2008.

Molecular epidemiology of tuberculosis

All new *M. tuberculosis* strains were genotyped in 2008. The typing was carried out according to internationally harmonised typing methods (spoligotyping and MIRU-VNTR typing). Genotyping was used to trace the source of infection in 15 different situations, including 43 cases of tuberculosis.

At the beginning of 2008, a boy who was under six months old was diagnosed with pulmonary tuberculosis. Despite extensive investigation, the source of infection could not be determined. In late autumn, two new cases of tuberculosis with a disease caused by the same genotype were diagnosed in Pirkkala. An extensive contact investigation showed that these new patients had most likely contracted

the infection at a local restaurant (one was a waiter and the other a loyal customer). In further investigation, a likely source of infection for the outbreak was found among loyal customers of the same restaurant, which was confirmed by genotyping. The source had suffered from symptoms for a long time. Because the source of infection had been contagious for at least a year and a half before being diagnosed with tuberculosis, extremely extensive contact investigation was launched in Pirkkala. The investigation also found a link between the first case diagnosed in a child and the source of infection that caused the outbreak. New-borns are especially susceptible to contracting an infection and the clinical disease when exposed to infection. By the time of reporting, investigation of the outbreak described here had found six cases of tuberculosis and a few symptom-free infected persons.

Table 8. Incidence of tuberculosis in Finland 1995–2008.

Year	Pulmonary tuberculosis				Other tuberculosis		All cases			
	Cases	Cases / 100 000	Cases with positive sputum smear	Cases with positive sputum smear / 100 000	Cases	Cases / 100 000	Cases	Cases / 100 000	Culture-confirmed cases	Proportion of culture-confirmed cases (%)
1995	435	8,5	243	4,8	227	4,5	662	13	472	71,3
1996	432	8,4	241	4,7	213	4,2	645	12,6	510	79,1
1997	363	7,1	188	3,7	212	4,1	575	11,2	435	75,7
1998	397	7,7	201	3,9	231	4,5	628	12,2	491	78,2
1999	382	7,4	180	3,5	183	3,5	565	11	487	86,2
2000	370	7,2	227	4,4	167	3,2	537	10,4	451	84
2001	316	6,1	158	3	178	3,4	494	9,5	411	83,2
2002	295	5,7	138	2,7	176	3,4	471	9,1	391	83
2003	291	5,6	148	2,8	121	2,3	471	7,9	347	84,2
2004	230	4,4	127	2,4	102	2	332	6,4	286	86,1
2005	265	5,1	135	2,6	96	1,8	361	6,9	316	87,5
2006	208	4,0	98	1,9	82	1,6	290	5,5	265	91,4
2007	226	4,3	92	1,7	101	1,9	327	6,2	245	74,9
2008	225	4,2	109	2,1	121	2,3	346	6,5	249	72

OTHER INFECTIONS

Haemophilus (*Haemophilus influenzae*)

In 2008, there were 45 reported infections caused by the *Haemophilus influenzae* bacterium, diagnosed in blood or CSF. *Haemophilus influenzae* type b caused an infection in two adults and in one child a little under two years of age. The child had received three doses of Hib vaccine in accordance with the vaccination programme. The adults were in an age group for which this vaccination was not yet included in the vaccination programme in their childhood. Children born in 1985 or later have received Hib vaccine at the healthy baby clinic. Since the beginning of 2005, under the revised vaccination programme, Hib vaccination is administered as a component of a combination vaccine at three, five, and 12 months. The efficiency of the vaccination is monitored, and

vaccination data are investigated for all children diagnosed with Hib.

Meningococcus (*Neisseria meningitidis*)

The number of meningococcus infections detected in blood or CSF totalled 29, which is clearly less than in other recent years. The serogroup distribution was the same as before. The majority of cases (66%) were caused by group B meningococcus. There were eight group C strains, and group Y meningococcus made two people ill. Seven cases were diagnosed in 0–4-year-olds.

In February–March, two conscripts in Kainuu contracted a group B meningococcal infection. The typing results indicated that the strain was the same. No other temporal or local clusters were detected.

Table 9. Meningococcal infections by serogroup, 1995–2008.

Year	Group A	Group B	Group C	Group Y	Group W135	Unknown	Total
1995	-	50	22	-	-	6	78
1996	-	59	15	3	-	2	79
1997	-	36	5	3	-	2	46
1998	-	44	7	2	-	1	54
1999	-	35	9	8	1	5	58
2000	-	30	11	2	3	2	48
2001	-	34	9	4	1	3	51
2002	-	36	6	4	1	2	49
2003	-	28	5	6	-	2	41
2004	-	29	5	4	2	4	44
2005	-	33	1	3	-	3	40
2006	-	38	5	1	-	1	45
2007	-	29	8	5	-	1	43
2008	-	19	8	2	-	-	29

MMR diseases (morbili, parotitis epidemica and rubella)

In 2008, the number of measles cases reported to the NIDR totalled five. Four of these cases were in foreigners. In August, two British children contracted measles while vacationing in Finland. A large number of young children not yet vaccinated against measles were exposed to the infection while the Britons visited a doctor. This led to extensive investigative and preventive measures. A 17-year-old Swiss woman and a 26-year-old Englishman were also diagnosed with measles. All foreign patients had arrived in Finland right before they fell ill, which means they had contracted the infection in their home country. The only Finnish patient was a 42-year-old woman who most likely acquired measles during a trip to Thailand.

Five cases of mumps were reported in Finland. The patients' ages ranged from 31 to 45 years. Two of them were foreigners, and one was born abroad. Infections were acquired in Greece, Algeria, Thailand, and Tanzania. The source of infection of an unvaccinated 35-year-old Finnish woman remained unclear. Not a single case of rubella was reported in 2008.

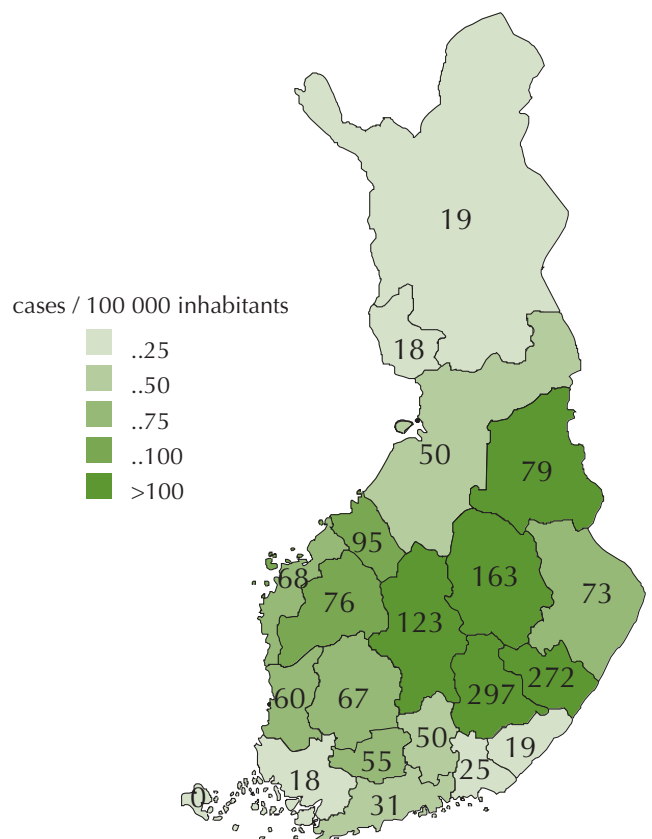
Measles, mumps, and rubella (the MMR diseases) are typical children's diseases caused by viruses. Their prevention in Finland was initiated by launching the MMR vaccination programme in 1982. As a result of the programme, endemic cases have not been diagnosed in Finland since the mid-1990s. In the past 10 years, nearly

all diagnosed MMR cases were acquired in a country where MMR diseases still commonly occur.

Puumala virus

The number of reported cases of Puumala virus reached a record level, over 3,200 cases. In each of the previous peak years, 2002 and 2005, there were about 2,500 cases. The number of cases varies, depending on the virus reservoir, the size of the bank vole population. The variation usually follows a three-year

Figure 14. Incidence of Puumala virus by hospital district 2008.



cycle such that two abundant years are followed by a quieter year. The frequency of epidemic nephropathy is greatest in November–December. In 2008, cases were being diagnosed more frequently already in July. By the beginning of November, over 2,000 cases of epidemic nephropathy had been diagnosed. November and December were the peak months, with 658 cases reported in December alone. The patients’ age and gender distribution was the same as before. Of the patients, 58% were men, and most patients were of working age. There were 165 (5%) under 20 years of age. Once again, the rates of incidence were highest in the hospital districts of Etelä-Savo (297/100,000) and Itä-Savo (272/100,000). (Figure 14)

Tick-borne encephalitis (TBE)

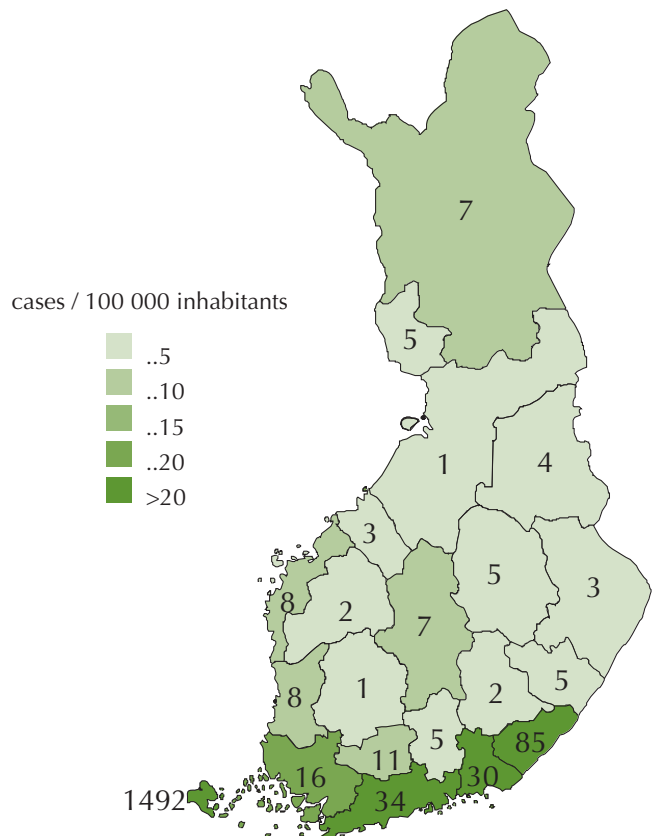
Every year since reporting began, 12–41 cases of TBE have been diagnosed in Finland. In 2008, the number of TBE cases reported to the NIDR totalled 23, of which one was a TBE infection in a Swede acquired in Sweden. In 2008, people contracted TBE in June–October, with July–September being the prime time. The patients’ age range was 11 to 76 years.

Before the vaccination campaign that was launched in Åland in 2006, about two thirds of the patients were from Åland. In 2007, five people contracted TBE on the Åland islands. The corresponding figure in 2008 was 10, which increases these cases’ proportion from the 25% of the previous year to 45% of all cases. Two TBE patients living

on the islands had received appropriate vaccinations.

In order to identify the place of acquisition, communicable disease doctor from the National Institute for Health and Welfare interviewed patients with TBE diagnosed in 2008 and/or studied their patient records. One patient had contracted an infection in Simo and one in Varkaus, far from the well-known endemic TBE regions of Isosaari in Helsinki, Kokkola, Lappeenranta, the Turku archipelago, and Åland. One patient contracted TBE either in Simo or in the Vaasa-Kokkola archipelago,

Figure 15. Incidence of borrelia cases by hospital district 2008.



one patient in Isosaari, two vacationers in Åland, four in the Turku archipelago, and one in Lappeenranta. One Finn acquired TBE in Estonia. According to the Swedish Smittskyddsinstitutet, six Swedes acquired TBE on the Åland islands.

Because of the systematic investigation of the place of acquisition, Närpiö (in 2007), Varkaus, and Simo have been identified as possible endemic TBE regions. This does not change the current vaccination recommendations. THL continues to identify the place of acquisition in the cases diagnosed.

If a patient falls ill with meningitis or encephalitis between May and October even though he or she has not noticed a tick bite and has not been in an identified endemic TBE region, TBE should be suspected.

Tularemia (*Francisella tularensis*)

In 2008, the NIDR received 116 (2/100,000) notifications of microbiologically confirmed tularemia infections. The incidence rate varies considerably on the basis of outbreaks (0.5–18/100,000). Widespread tularemia outbreaks have occurred four times in the past 10 years: in 2000 (926 cases), 2003 (823 cases), 2006 (475 cases), and 2007 (403 cases). In other years, 100 cases on average have been reported. The majority of the cases were diagnosed in the hospital districts of Pohjois-, Keski-, and Etelä-Pohjanmaa and in Central Finland, all locations where tularemia has traditionally been endemic. Infections were diagnosed in all age

groups, most frequently in 30–65-year-olds. Seventy-three patients (63%) were male.

The majority of cases were diagnosed between August and October. Tularemia is mainly transmitted by insect stings. When the infection is transmitted from an insect to a human, the site of the bite becomes red, swollen, and sore, and it develops into an ulcer. The infection spreads into local lymph glands (ulcero-glandular form). The disease may also be transmitted through airways or via direct contact with an ill animal.

Pogosta disease (Sindbis virus)

The number of Pogosta disease cases has remained low since 2003. In 2008, there were 30 reported cases (0.6/100,000). The majority of diagnoses were made between August and September. As before, the incidence was highest in the hospital districts of Itä- and Pohjois-Savo, Pohjois-Karjala, and Central Finland. The patients were 25–78 years old (median: 49.5 years), and 57% were women.

Extensive Pogosta disease outbreaks occur in Finland with seven-year intervals (1974, 1981, 1988, and 1995). The most recent outbreak was in 2002, when nearly 600 cases were reported. Outbreaks' recurrence every seven years may be associated with local ecological factors and the cyclical variation of available animal reservoirs (forest game birds) or vectors. Sindbis virus is assumed to be transmitted mainly by insect stings.

Borrelia (Lyme disease)

In 2008, the number of borrelia cases reported was 1,277, which is about the same as in previous years. The incidence in the whole country was 24/100,000 on average, but there was significant regional variation (Figure 15). Once again, the most cases were seen in the province of Åland (1,492/100,000), accounting for a third of all diagnosed borrelia infections in Finland, 403 cases. As in previous years, the frequency of borrelia was highest in the autumn, from August to November. The majority of the cases (72%) involved over-45-year-olds. Fifty-three per cent of the patients were female.

Malaria

In 2008, there were 40 diagnoses of malaria in Finland. Of these, 33 were *Plasmodium falciparum* cases, including one *P. falciparum* + *P. vivax* mixed infection and one *P. falciparum* + *P. malariae* mixed infection. The remaining cases were five of *P. vivax* and two of *P. ovale*.

The majority of infections (33 cases, 82%) were acquired in Africa: 29 were acquired in western Africa and four in eastern Africa. Three infections were acquired on the Indian subcontinent, and four each in South-east Asia and Oceania. Twenty-five patients were Finns, and 15 were foreigners. Thirty-four of the patients were permanent residents of Finland, with 20 being native Finns who had taken a trip of less than six months to a malaria region and four being Finns residing in a malaria region.

Eight patients were immigrants from malaria regions who had visited their former home. Three were refugees who became ill immediately after arriving in Finland. Five were visitors to Finland.

The number of malaria cases, the countries of acquisition, and the risk groups remained approximately the same. The total number of malaria cases was higher than before because of a malaria cluster of 14 Finns travelling to Gambia at the end of 2008. The majority of the patients who fell ill with malaria had used no malaria prophylaxis or had used it irregularly.

Table 10. Malaria cases in Finland in 2008 by country of acquisition

Continent	Country	Cases
Asia	Thailand	1
	Cambodia	1
	Afghanistan	1
	India	1
	Nepal	1
	Total	5
Africa	Ghana	4
	Nigeria	4
	Gambia	14
	Sierra Leone	1
	Senegal	3
	Benin	2
	Guinea	1
	Kenya	1
	Mozambique	1
	Sudan	1
	Uganda	1
	Total	33
Oceania	Papua-New-Guinea	1
	Vanuatu	1
	Total	2
	Total	40

Blood and CSF findings in children

Blood culture findings in children

There were 590 cases with blood culture positive findings in children under 15 years of age in 2008, which is about a tenth less than in 2004–2007. A little over half of the findings were diagnosed in infants under 12 months old.

The microbial breakdown of the findings remained the same: Among children under 12 months of age, *Staphylococcus epidermidis* and other coagulase-negative staphylococci caused over a third of blood culture positive infections. The second most common cause (15% of the findings) was *Streptococcus agalactiae* (Group B streptococcus, GBS). It is typically

Table 11. Blood culture findings 1998–2008, infants (under 1 years of age)

Microbe / Microbial group	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<i>Staphylococcus, other than aureus</i>	57	84	76	99	112	81	146	129	142	131	120
<i>Streptococcus agalactiae</i>	48	42	38	41	46	37	45	73	55	51	49
<i>Escherichia coli</i>	48	39	43	39	40	39	37	41	44	42	38
<i>Staphylococcus aureus</i>	33	29	17	17	24	21	32	32	37	25	23
<i>Streptococcus pneumoniae</i>	17	16	28	19	17	25	28	26	27	21	26
<i>Streptococcus viridans</i> -group	6	10	6	10	8	12	15	12	10	9	8
<i>Enterococcus faecalis</i>	11	7	4	6	11	11	9	15	22	8	5
<i>Enterobacter</i> -species	7	10	6	6	6	6	5	3	13	8	6
<i>Klebsiella</i> -species	8	10	9	8	7	8	9	9	8	6	8
<i>Bacillus</i>	1	-	1	2	-	1	2	2	1	4	4
Other bacteria	41	35	37	22	35	28	36	17	27	28	34
Bacteria, total	277	282	265	269	306	269	364	359	386	333	313
Fungi	3	16	12	11	18	4	3	5	4	4	4
Total number of cases	280	298	277	280	324	273	367	364	390	337	317

Table 12. Blood culture findings 1998–2008, children (1–14 years)

Microbe / Microbial group	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<i>Streptococcus pneumoniae</i>	60	61	72	76	92	94	88	101	99	114	87
<i>Staphylococcus, other than aureus</i>	34	52	63	44	54	46	34	54	48	51	35
<i>Staphylococcus aureus</i>	48	57	42	35	58	47	58	41	37	42	40
<i>Streptococcus viridans</i> -group	26	19	18	22	12	12	18	24	24	23	21
<i>Streptococcus pyogenes</i>	10	11	9	9	10	12	4	-	9	13	11
<i>Escherichia coli</i>	13	14	20	5	13	13	15	10	16	12	13
<i>Klebsiella</i> -species	3	4	2	2	6	4	5	10	3	6	5
<i>Fusobacterium</i> -species	2	5	4	1	3	-	1	2	3	5	5
<i>Salmonella, other than Typhi</i>	2	4	1	1	1	1	1	1	2	5	2
<i>Enterococcus faecium</i>	-	-	2	2	4	1	2	2	3	4	2
Other bacteria	53	61	61	48	55	59	44	72	49	53	54
Bacteria, total	251	288	294	245	308	289	270	317	293	328	270
Fungi	3	7	5	1	3	3	1	1	5	4	3
Total number of cases	254	295	299	246	311	292	271	318	298	332	273

contracted from the mother's birth canal during labour and causes an infection in the new-born baby during the first days of life. Other common causes of infection were *Escherichia coli*, *Staphylococcus aureus*, and *Streptococcus pneumoniae* as expected. Methicillin-resistant *S. aureus* strains were not found among the reported cases. As in 2007, the proportion of enterococci in blood findings in infants was low (2%).

S. pneumoniae was the most common finding in 1–14-year-olds, accounting for about a third of the reported cases in this age group. It was followed by coagulase-negative staphylococci, *S. aureus*, and streptococci

viridans. One of the reported *S. aureus* cases involved MRSA.

Of all cases reported among children under 15 years of age, coagulase-negative staphylococci caused a little under a third of the blood culture positive infections. Infections caused by these bacteria were typically healthcare-associated; predisposing factors include a weakened immune system, medical procedures, and foreign devices (e.g., a central venous catheter). When compared with reports for other recent years, the children's blood findings in 2008 showed no significant changes. Fungi constituted only about one per cent of the findings.

Table 13. Cerebrospinal fluid culture findings 2002–2008, infants (under 1 year of age)

Microbe / Microbial group	2002	2003	2004	2005	2006	2007	2008
<i>Streptococcus agalactiae</i>	5	1	10	7	7	6	3
<i>Streptococcus pneumoniae</i>	3	6	8	3	1	4	3
<i>Staphylococcus, other than aureus</i>	8	4	5	4	3	2	5
<i>Neisseria meningitidis</i>	1	2	4	-	1	2	1
<i>Enterococcus faecalis</i>	-	1	1	-	2	1	-
Other bacteria	5	7	9	2	5	4	4
Bacteria, total	22	21	37	16	19	18	16
Fungi	-	-	-	-	-	-	-
Total number of cases	22	21	37	16	19	18	16

Table 14. Cerebrospinal fluid culture findings 2002–2008, children (1–14 years)

Microbe / Microbial group	2002	2003	2004	2005	2006	2007	2008
<i>Neisseria meningitidis</i>	7	4	4	5	7	5	3
<i>Streptococcus pneumoniae</i>	2	10	2	1	5	5	2
<i>Staphylococcus aureus</i>	1	2	2	-	-	2	3
<i>Staphylococcus, other than aureus</i>	10	3	6	4	-	1	5
<i>Streptococcus viridans</i> -group	-	1	1	-	2	-	-
Other bacteria	10	5	4	8	4	-	8
Bacteria, total	30	25	19	18	18	13	21
Fungi	-	-	1	-	-	-	-
Total number of cases	30	25	20	18	18	13	21

CSF findings in children

The number of bacterial and fungal findings related to children's central nervous system infections remained at the same level as in the preceding years. In 2008, there were a total of 37 reported cases, of which 16 were diagnosed in infants under 12 months old.

The most common findings in the under-12-month-olds age group were coagulase-negative staphylococci (5 cases), *S. agalactiae* (3 cases), and pneumococcus (3 cases). Other types of findings involved only single cases.

Unlike in the preceding years, coagulase-negative staphylococcus was also the most common finding among 1–14-year-olds. *Meningococcus* and *S. aureus* were reported three times and *Pneumococcus* twice. Other types of findings involved isolated cases.

Blood and CSF findings in adults

Blood culture findings in adults

The total number of blood culture findings in adults has grown steadily and is currently almost double that seen in

1998. In 2008, about 10,000 cases were diagnosed, which is 800 cases more than in 2007. Gram-positive bacteria are still more common in the working-age population (15–64-year-olds) and gram-negative bacteria among those aged 65 or more. Anaerobic bacteria constituted less than four per cent and fungi about two per cent of all blood culture positive findings.

In the working-age population, the most common bacterial finding was *Escherichia coli*, constituting about 20% of all cases. It was followed by *Staphylococcus aureus*, *Streptococcus pneumoniae*, and coagulase-negative staphylococci.

E. coli was also the most common blood culture finding among patients aged 65 years or more (accounting for a third of all findings). The next most common bacterial findings were *S. aureus*, coagulase-negative staphylococci, *Klebsiella* species, and *S. pneumoniae*.

Group A streptococci (*Streptococcus pyogenes*) cases continue to increase among the working-age population. The prevailing emm types have given way in part to new, less known types, but

Table 15. *S. pyogenes* blood findings according to emm-type 2004–2008.

Cases notified to NIDR	Strains examined	emm1	emm28	emm84	other	NT
2004	130	6 (4,6%)	46 (35,4%)	0 (0,0)	72 (55,4%)	6 (4,6%)
2005	113	9 (8,0%)	22 (19,5%)	1 (0,9%)	79 (69,9%)	2 (1,8%)
2006	163	25 (15,3%)	33 (20,2%)	24 (14,7%)	70 (42,9%)	11(6,7%)
2007	205	58 (28,3%)	26 (12,7%)	32 (15,6%)	84 (41,0%)	5 (2,4%)
2008	226	52 (23,0%)	47 (20,8%)	9 (4,0%)	113 (50,0%)	5 (2,2%)

Table 16. Blood culture findings 1998–2008, working-age population (15–64 years)

Microbe / Microbial group	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<i>Escherichia coli</i>	495	547	532	613	580	645	707	780	797	838	861
<i>Staphylococcus aureus</i>	340	389	394	437	457	445	486	457	564	544	525
<i>Staphylococcus, other than aureus</i>	319	347	402	406	444	400	421	399	401	407	430
<i>Streptococcus pneumoniae</i>	283	298	310	343	330	406	387	376	346	353	479
<i>Klebsiella</i> -species	106	114	115	114	134	121	159	184	145	159	198
<i>Streptococcus pyogenes</i>	63	81	84	60	93	78	93	76	105	133	157
<i>Streptococcus viridans</i> -group	91	115	117	116	104	121	141	141	130	118	140
<i>Streptococcus, other beta-haemolytic</i>	59	64	59	66	78	79	102	96	127	117	113
<i>Enterococcus faecalis</i>	57	76	67	95	98	84	80	100	83	101	83
<i>Streptococcus agalactiae</i>	55	60	63	76	78	68	64	99	76	83	96
Other bacteria	690	652	686	748	662	681	694	795	802	829	1084
Bacteria, total	2558	2743	2829	3074	3058	3128	3334	3503	3576	3682	3968
Fungi	62	58	56	71	54	80	71	66	80	84	100
Total number of cases	2620	2801	2885	3145	3112	3208	3405	3569	3656	3766	4068

Table 17. Blood culture findings 1998–2008, aged population (65 years and more)

Microbe / Microbial group	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
<i>Escherichia coli</i>	967	1012	1033	1178	1213	1314	1466	1623	1706	1761	1873
<i>Staphylococcus aureus</i>	296	337	397	398	449	466	483	483	601	567	671
<i>Staphylococcus, other than aureus</i>	216	281	349	361	363	343	370	402	395	415	464
<i>Klebsiella</i> -species	177	167	201	241	230	252	342	339	326	340	422
<i>Streptococcus pneumoniae</i>	185	178	189	216	200	241	239	229	270	293	325
<i>Enterococcus faecalis</i>	116	119	143	142	149	146	192	183	202	217	217
<i>Pseudomonas aeruginosa</i>	94	116	119	132	148	148	138	151	154	189	191
<i>Streptococcus, other beta-haemolytic</i>	73	97	87	105	100	123	135	140	174	171	176
<i>Bacteroides fragilis</i> -group	81	99	96	104	96	117	120	135	119	135	146
<i>Enterococcus faecium</i>	41	43	60	61	48	75	96	73	108	129	126
Other bacteria	606	596	677	758	721	774	863	924	965	986	1544
Bacteria, total	2852	3045	3351	3696	3717	3999	4444	4682	5020	5203	5733
Fungi	43	51	68	71	71	113	77	68	76	83	93
Total number of cases	2895	3096	3419	3767	3788	4112	4521	4750	5096	5286	5826

Table 18. Cerebrospinal fluid culture findings 2002–2008, working-age population (15–64 years)

Microbe / Microbial group	2002	2003	2004	2005	2006	2007	2008
Staphylococcus, other than aureus	42	28	40	48	44	24	41
Neisseria meningitidis	19	15	11	15	20	16	4
Staphylococcus aureus	6	10	17	10	9	16	13
Streptococcus pneumoniae	18	26	21	15	17	13	26
Pseudomonas, other than aeruginosa	6	6	11	5	5	5	4
Other bacteria	44	26	27	47	51	48	53
Bacteria, total	135	111	127	140	146	122	141
Fungi	2	1	6	2	3	6	1
Total number of cases	137	112	133	142	149	128	142

Table 19. Cerebrospinal fluid culture findings 2002–2008, aged population (65 years and more).

Microbe / Microbial group	2002	2003	2004	2005	2006	2007	2008
Staphylococcus, other than aureus	12	9	11	15	12	14	13
Streptococcus pneumoniae	4	5	4	8	10	4	7
Enterococcus faecalis	2	3	-	2	2	3	-
Staphylococcus aureus	2	7	7	5	3	2	3
Listeria monocytogenes	2	4	2	4	3	2	2
Other bacteria	20	17	13	12	12	7	12
Bacteria, total	42	45	37	46	42	32	37
Fungi	2	-	1	1	2	-	1
Total number of cases	44	45	38	47	44	32	38

the emm 1 type (previously T1M1) that caused severe illnesses in the past has also increased in prevalence. The most common emm types of the preceding years (emm1 and emm28) still prevail; the proportion of the emm84 type clearly decreased in 2008. A new type, emm119.1, has emerged. The latter was the fourth most common type with its 8% share (Table 19).

CSF findings in adults

The number of bacterial and fungal findings in CSF has remained stable in the 2000s; in 2008, in total, 150 findings in over-15-year-olds were reported.

Coagulase-negative staphylococcus was reported in about a third of the

cases in working-age patients. The most common severe pathogens were pneumococcus (18%), *S. aureus* (9%), and meningococcus (2%). The proportion of pneumococcus in the findings had clearly increased, and that of meningococcus had decreased, when compared with 2002–2007 figures.

In patients aged 65 years or older, coagulase-negative staphylococcus accounted for one third of the findings. The most commonly reported actual pathogens were pneumococcus (18%), *S. aureus* (8%), and *Listeria monocytogenes* (5%); no cases of Enterococcus were reported in 2008.

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