COMMUNICABLE DISEASE SURVEILLANCE CENTRE

2000 Review of Communicable Diseases

Northern Ireland

PUBLIC HEALTH LABORATORY SERVICE
PROTECTING THE POPULATION FROM INFECTION

2000 Review of Communicable Diseases

Northern Ireland

CDSC (NI) would wish to acknowledge the following individuals and organisations in providing data for inclusion in this report:

Consultants in Communicable Disease Control

Clinical laboratories in Northern Ireland

Department of Health, Social Services & Public Safety, Northern Ireland

Public Health Laboratory Service

Registrar General, Northern Ireland

Scottish Centre for Infection & Environmental Health

Department of Agriculture & Rural Development, Northern Ireland

Staff at Genito-Urinary Medicine Clinics

National Disease Surveillance Centre (NDSC)

Contents

Foreword

This is the second annual report from the Communicable Disease Surveillance Centre for Northern Ireland (CDSC (NI)). The report highlights some of the main communicable disease issues occurring during the year. While there was a reduction in salmonella food poisoning, with Northern Ireland no longer the region in the United Kingdom with the highest rates of infection, there were two large waterborne outbreaks of cryptosporidiosis which caused considerable gastrointestinal illness in the community. On a more positive note, the introduction of the meningococcal C conjugate vaccine was associated with a significant reduction of illness due to Group C meningococcal infection. The vast majority of parents continue to support the measles, mumps and rubella (MMR) vaccine programme though vaccine uptakes are not as high as in previous years. This report also notes the rise in sexually transmitted infections particularly among young people.

The 1999 report emphasised the importance of establishing an enhanced influenza surveillance programme in Northern Ireland to provide early warning to the health sector of influenza virus circulating in the community. This commenced during 2000 and will alert primary care, Trusts and Boards of an imminent increase in demand for services as patients develop influenza related complications. A description of the first year's enhanced surveillance is described in detail later in this document.

It is not possible in an annual report to provide a detailed commentary on all the organisms and reports received by CDSC (NI). Rather the focus is to highlight the main trends and emerging issues. The topics in this report have implications for us all – whether we are parents, patients, producers of food or providers of clean water. Many infections can be prevented by simple measures such as regular, thorough handwashing. This is as relevant in hospitals as in the home or restaurant. Thus everyone has a role in communicable disease control.

Surveillance of communicable disease is dependent on the voluntary co-operation of many individuals and agencies. CDSC (NI) greatly values the assistance and co-operation of all those involved in the prevention, investigation and control of communicable disease and for providing much of the data on which this report is based.

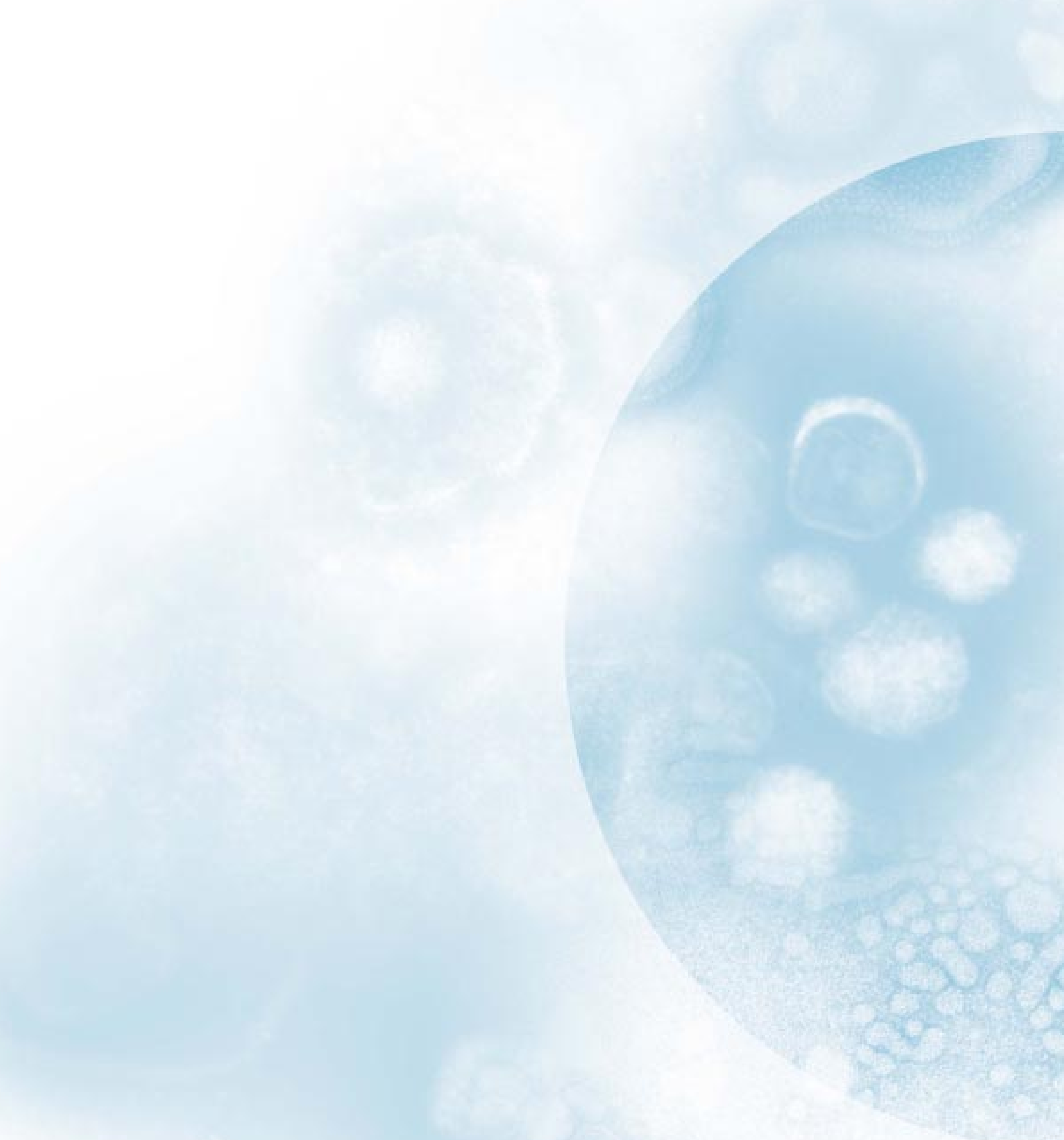
Surveillance is also about providing information for action. It is hoped that this report, while primarily written for policy makers and a professional audience, will continue to be of interest to consumer groups, students and members of the public. Feedback regarding CDSC (NI)'s first report was encouraging and affirms the need for an annual report describing communicable disease in Northern Ireland.

This report is not the work of any one individual but reflects the combined input from all the staff at CDSC (NI) whose enthusiasm and attention to detail is deeply appreciated.

B Smyth
Regional Epidemiologist

Chapter 1

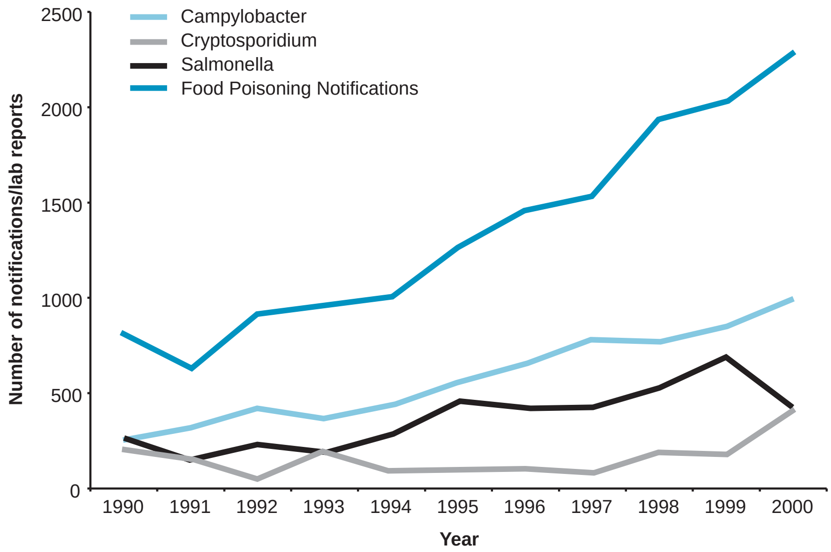
Food borne and gastrointestinal infections



Food borne and gastrointestinal infections

Food poisoning notifications increased by 12% from 1999 to 2000, continuing the trend of the last decade. The percentage increase from 1999 to 2000 is more than double the percentage increase from 1998 to 1999. However, the incidence of food poisoning in Northern Ireland remains low compared with the rest of the United Kingdom – approximately 135 notifications per 100,000 population compared to 164 and 189 in England & Wales and Scotland respectively.

Figure 1.1 Food poisoning: Notifications and laboratory reports, 1990-2000, Northern Ireland

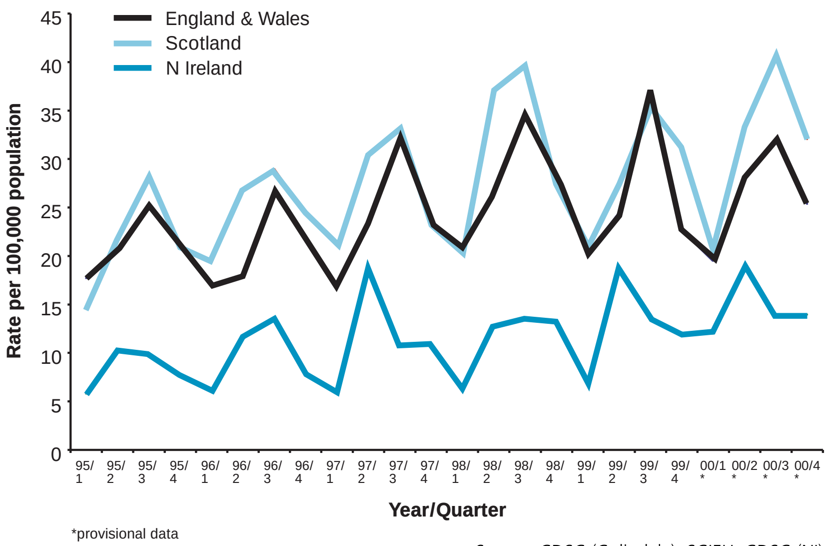


Source: DHSSPS, CDSC (NI)

Campylobacter

Reports of campylobacter infection first exceeded reports of salmonella infection in Northern Ireland in 1991, and campylobacter remains the single most common form of bacterial food poisoning with 1001 reports in 2000 (almost 2.5 times more than salmonella). Reports have increased steadily from 1993 and this trend has continued with a 17% rise in reports between 1999 and 2000. Scotland also experienced an increase in campylobacter reports between 1999 and 2000 (11%), and England and Wales experienced a slight increase of 1%. Although Northern Ireland showed the greatest percentage increment in 2000, the incidence of campylobacter in the Province remains considerably lower that the rest of the United Kingdom, 59 cases per 100,000

Figure 1.2 Campylobacter: Quarterly rates of faecal isolates, 1995-2000*, England & Wales, Scotland and Northern Ireland



Source: CDSC (Colindale), SCIEH, CDSC (NI)

population compared to 106 and 127 in England & Wales, and Scotland respectively. The reasons for this marked variation are unclear.

Reports of campylobacter infection peak in the early summer.

The rate of campylobacter infection is

considerably higher in children under 5 years of age.

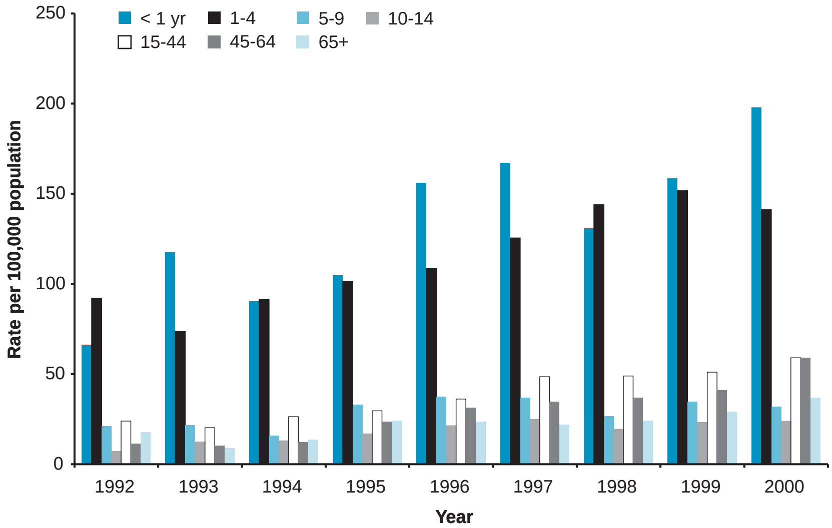
Salmonella

Having increased during the 1990s such that in 1999, the incidence of salmonella in Northern Ireland exceeded that in the rest of the UK for the first time, reports of salmonella dropped to 425 in 2000 – a decrease of almost 40% compared to the number of reports in 1999. The rate in 2000 fell to that last observed in 1996.

Together, *Salmonella enteritidis* and *Salmonella typhimurium* serotypes were responsible for approximately 77% of all salmonella isolates in 2000.

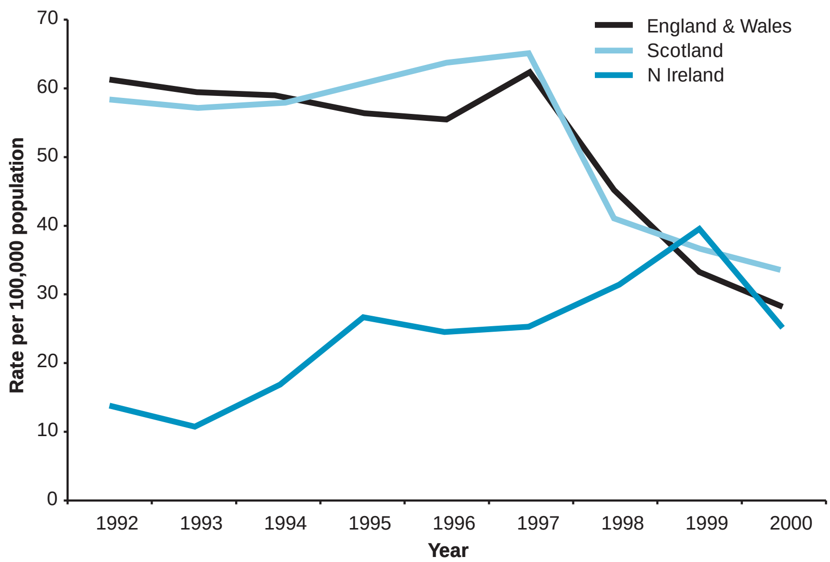
Salmonella enteritidis is the most frequently isolated serotype, accounting for over half of the total salmonella isolates in 2000. The marked reduction in salmonellosis in 2000 can be attributed to the 50% reduction in *S. enteritidis* – 462 were reported in 1999 and 235 in 2000. The most frequently isolated phage type (PT) of *S. enteritidis* is PT 4; 160 reports were received in 2000, accounting for 68% of *S. enteritidis* isolations and 38% of all reported salmonella infections in Northern Ireland during 2000. There was one reported salmonella outbreak during 2000, involving 18 individuals of whom 12 were confirmed as having *S. enteritidis* PT 4 infection. No specific foodstuff was identified as the vehicle for infection (Table 1.4).

Figure 1.3 Laboratory reports of campylobacter per 100,000 population by age group, 1992-2000, Northern Ireland



Source: CDSC (NI)

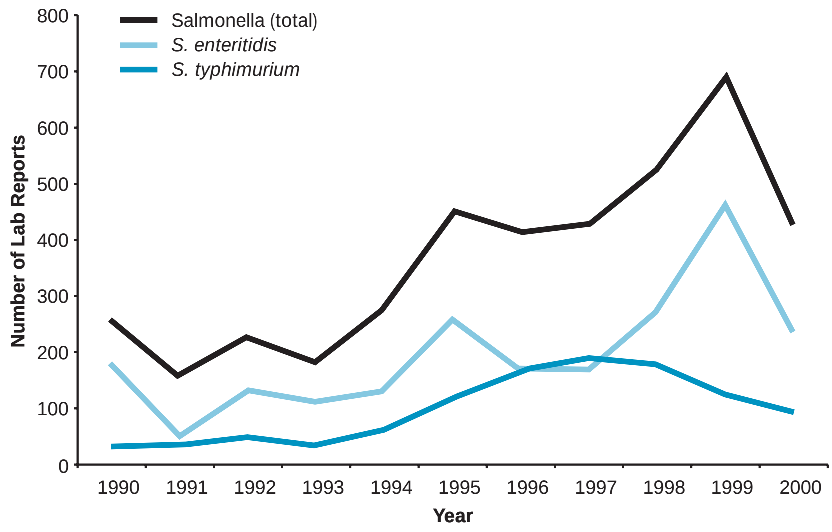
Figure 1.4 Salmonellosis – Faecal isolates, excluding *S. typhi* and *S. paratyphi*, per 100,000 population, 1992-2000, England & Wales, Scotland and Northern Ireland



Source: CDSC (Colindale), SCIEH, CDSC (NI)

Reports of *Salmonella typhimurium* exceeded reports of *Salmonella enteritidis* only once during the past decade, in 1997, and then began to decline. It is the most commonly isolated serotype after *S. enteritidis*. The most frequently isolated phage type of *S. typhimurium* is definitive type (DT) 104: almost 40% of *S.typhimurium* isolates in 2000 were DT 104. Laboratory reports of *S. typhimurium* fell

Figure 1.5 Laboratory reports of Salmonella,1990-2000, Northern Ireland



Source: CDSC (NI)

by 25% from 124 in 1999 to 93 in 2000 and reports of *S. typhimurium* DT 104 fell by 44% from 66 in 1999 to 37 in 2000.

Table 1.1 lists serotypes for which more than one report was received from 1996 to 2000. *S. enteritidis* and *S. typhimurium* are consistently the top two serotypes.

There were 7 reports of *Salmonella dublin* during 2000. This compares with only one report during 1999 and is the highest annual total since 1992. *S. dublin* is a host-adapted serovar that primarily affects cattle and occasionally sheep. The Department of Agriculture and Rural Development received almost twice as many veterinary reports of *S. dublin* during 2000 compared with 1999. The reason for this increase in cattle is not entirely clear but may be related to difficulties with vaccine supply earlier in the year. Two of the seven human cases were known to have had contact with cattle.

In 2000, almost all salmonella isolates were recovered from faeces – only three (0.7%) were isolated from blood. These cases of salmonella bacteraemia were caused by *S. enteritidis* PT 4, *S. typhi* and *Salmonella sp*. There were eighteen cases of salmonella bacteraemia reported in 1999. Less than 3% of all salmonella isolates in Scotland and in England & Wales reported during 2000 were bacteraemic.

Table 1.1: Top Salmonella serotypes, 1996-2000, Northern Ireland

1996		1997		1998		1999		2000	
Total Salmonella	413	Total Salmonella	432	Total Salmonella	534	Total Salmonella	689	Total Salmonella	425
enteritidis	171	typhimurium	185	enteritidis	272	enteritidis	462	enteritidis	235
typhimurium	169	enteritidis	169	typhimurium	177	typhimurium	124	typhimurium	93
virchow	13	bredeney	20	virchow	15	virchow	12	dublin	7
bredeney	10	hadar	7	hadar	7	bredeney	10	hadar	7
agona	7	agona	5	bredeney	4	hadar	6	virchow	6
hadar	5	bareilly	4	corvallis	3	braenderup	5	bredeney	5
dublin	3	heidelberg	4	dublin	3	heidelberg	5	kentucky	4
newport	3	virchow	4	oranienburg	3	agona	4	derby	3
bovis-morbificans	2	kentucky	3	aberdeen	2	java	4	infantis	3
heidelberg	2	newport	3	agona	2	stanley	4	java	3
kottbus	2	panama	2	heidelberg	2	thompson	4	muenster	3
schwarzengrund	2	remo	2	infantis	2	anatum	2	agona	2
stanley	2	stanley	2	muenchen	2	hidalgo	2	blockley	2
		thompson	2	newport	2	infantis	2	brandenburg	2
				paratyphi	2	mbandaka	2	heidelberg	2
				saint-paul	2			lagos	2
				schwarzengrund	2			livingstone	2
				stanley	2				
				weltevreden	2				

Source: CDSC (NI)

Travel related salmonella infection

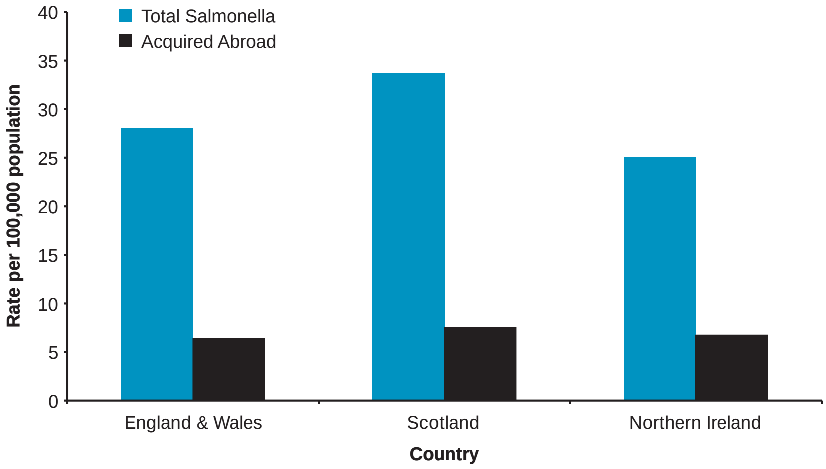
Global travel is becoming more and more common, however infection control measures are often poorly developed. During 2000 it is estimated that 57 million people in the UK travelled on more than 30 million overseas holidays. The most popular reason for visits abroad i.e. outside the UK during 2000 was to holiday, followed by business and visiting friends/ relatives. There were more than three times the number of visits abroad by UK residents in 2000 than in 1980[1].

There were 425 laboratory reports of individuals with salmonella infection reported to CDSC (NI) during 2000 in Northern Ireland. One hundred and fourteen isolates (27%) were identified as acquired abroad. This compares with 23% of isolates reported in England & Wales and 22% in Scotland that were acquired abroad.

During 2000, of the Northern Ireland residents thought to have acquired salmonella abroad, 40% acquired infection in Spain (including Canary Islands and Balearic Islands).

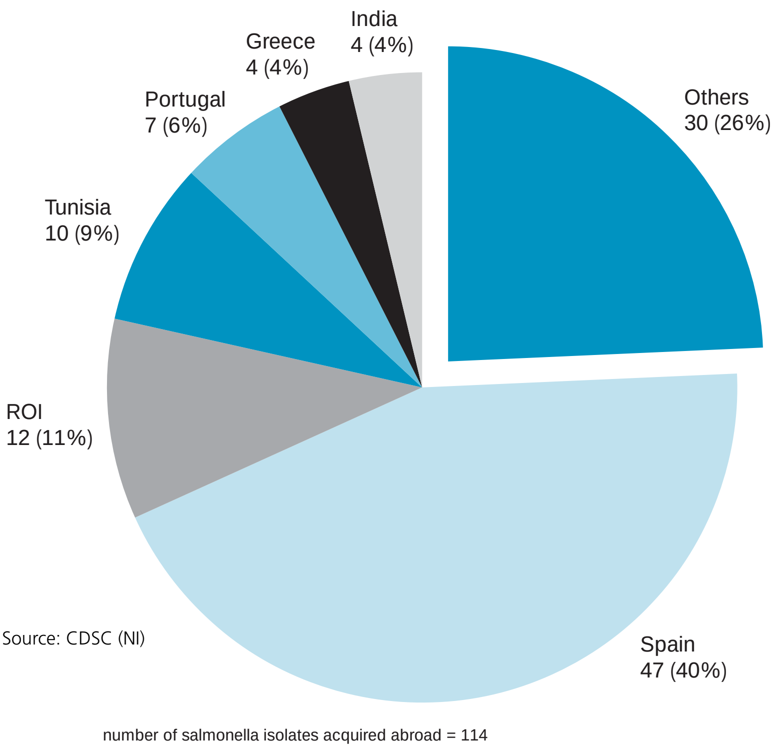
Reports of salmonella infection peak in the summer months. According to the Federation of Tour Operators (FTO), who represent 90% of all package holidays sold in the UK, the peak season for overseas package holidays is May to October[2]. There was a marked peak in salmonella isolates in July/August which is frequently referred to as the peak season for holidays.
S. enteritidis was the most common salmonella serogroup acquired abroad

Figure 1.6: Rate of laboratory reports of *Salmonella*, 2000, England & Wales, Scotland and Northern Ireland



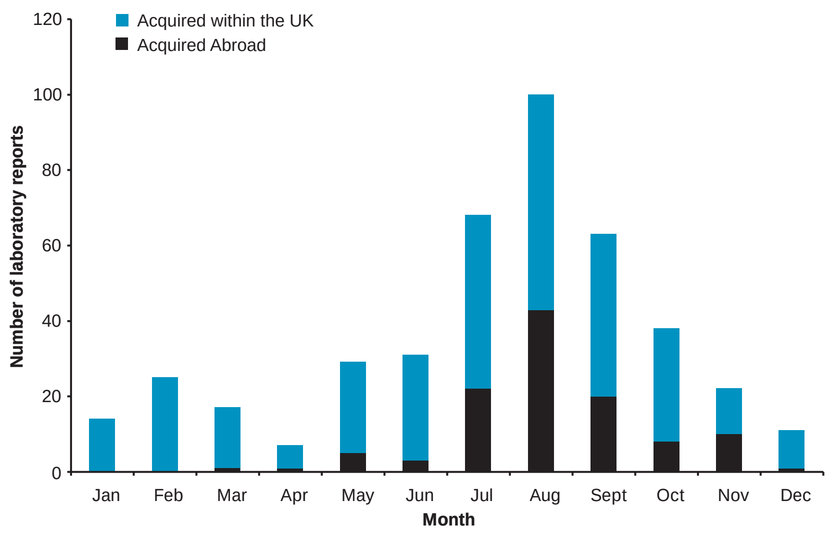
Source: CDSC (Colindale), SCIEH, CDSC (NI)

Figure 1.7: Travel related salmonella by country of infection among Northern Ireland residents, 2000



Source: CDSC (NI)

Figure 1.8: Total laboratory reports of salmonella by month, 2000, Northern Ireland



Source: CDSC (NI)

accounting for 58% of travel salmonella in 2000 (Table 1.2). 41% of travel associated *S. enteritidis* infection was due to PT 4.

Table 1.2: Salmonella serotypes acquired abroad, 2000, Northern Ireland

Serotype	Total
agona	1
blockley	2
brandenburg	2
drypool	1
dublin	2
enteritidis	66
hadar	4
heidelberg	2
infantis	1
java	2
kentucky	2
lagos	1
livingstone	1
london	1
manhattan	1
montevideo	1
muenster	1
schwarzengrund	1
sp	6
typhi	1
typhimurium	12
virchow	3
Total	**114**

Source: CDSC (NI)

The age groups and sex of those affected are shown in Table 1.3. The age range was 10 months to 66 years with an average of 29 years. Age was not specified on 5% of laboratory reports. It is particularly notable that the 25 to 34 year old age group was associated with 24% of all travel associated salmonella.

Table 1.3: Age groups of salmonella isolates acquired abroad (n=114) reported to CDSC (NI), 2000

Age Group	No of isolates (%)	Male	Female
0-4	3 (3)	2	1
5-14	17 (15)	12	5
15-24	23 (20)	11	12
25-34	27 (24)	17	10
35-44	17 (15)	10	7
45-54	16 (14)	7	9
55-64	3 (3)	0	3
65+	2 (2)	1	1
Not Known	6 (5)	4	2
Total	**114**	**64**	**50**

Source: CDSC (NI)

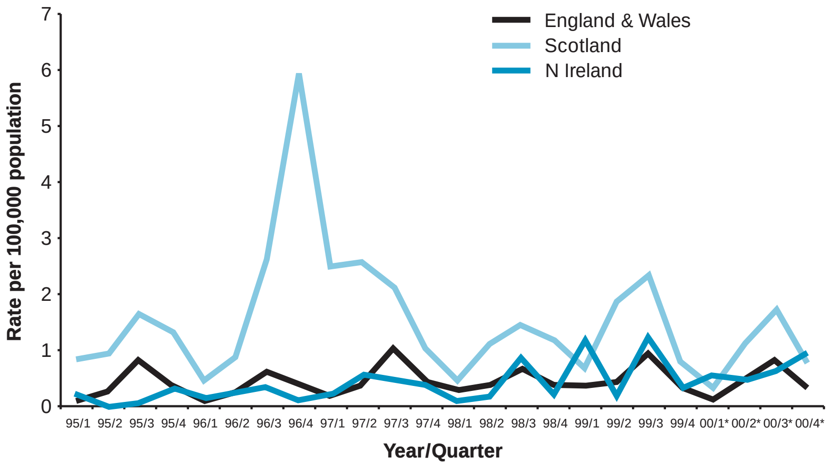
Food poisoning acquired abroad is therefore a major public health issue. Contaminated food or water or by person to person faecal/oral spread are the major sources of gastro-intestinal infection amongst travellers. The Department of Health (DoH) in London has issued the following health advice for travellers[3]. However, little is known about compliance when abroad.

- Always wash your hands after going to the lavatory, before handling food and before eating.
- If you have any doubts about the water available for drinking, washing food or cleaning teeth, boil it, sterilise it with disinfectant tablets or use bottled water – preferably carbonated gas – in sealed containers.
- Avoid ice unless you are sure it is made from treated and chlorinated water. This includes ice used to keep food cool as well as ice in drinks.
- It is usually safe to drink hot tea or coffee, wine, beer, carbonated water and soft drinks, and packaged or bottled fruit juices.
- Eat freshly cooked food which is thoroughly cooked and still piping hot.
- Avoid food which has been kept warm.
- Avoid uncooked food, unless you can peel or shell it yourself.
- Avoid food likely to have been exposed to flies.
- Avoid ice cream from unreliable sources, such as kiosks or itinerant traders.
- Avoid – or boil – unpasteurised milk.
- Fish and shellfish can be suspect in some countries. Uncooked shellfish, such as oysters, are a particular hazard.

E. coli O 157

There were the same number of laboratory reports of *E. coli* O157 in Northern Ireland in 2000 as there were in 1999. Of the 54 reports in 2000, 47 (87%) were found to be vero-toxin producing. The incidence of VTEC in 2000 in Northern Ireland is higher than in England & Wales (2.59 per 100,000 population compared to 1.70 per 100,000 population), but lower than in Scotland (3.91 per 100,000 population). The Scottish peak in the last quarter of 1996 was due to the Lanarkshire outbreak.

Figure 1.9: VT producing *Escherichia coli* O 157 – Faecal isolations, 1995-2000*, England & Wales, Scotland and Northern Ireland



*provisional data

Source: CDSC (Colindale), SCIEH, CDSC (NI)

Foodborne and gastrointestinal outbreaks: 2000

Outbreak surveillance is primarily based on reports received from Consultants in Communicable Disease Control. During 2000 CDSC (NI) was made aware of five foodborne outbreaks affecting 140 people and 15 other gastrointestinal outbreaks affecting at least 458 people (Table 1.4). This compares with nine foodborne outbreaks and 6 gastrointestinal outbreaks in 1999.

There was only one salmonella outbreak reported in 2000, in contrast to six reported during 1999. The reduction in salmonella outbreaks therefore mirrors the marked decrease in reported cases of salmonella, particularly *Salmonella enteritidis* PT4, noted over the past twelve months.

During 2000, there were two major waterborne outbreaks of cryptosporidiosis within the Eastern Board area. These outbreaks, involving different water supplies, were associated with 246 confirmed cases of cryptosporidiosis. These outbreaks accounted for 59% of all cases of cryptosporidiosis reported in 2000.

In three foodborne outbreaks a bacterial cause was not identified and the pattern of illness was suggestive of a viral infection, though this could not be laboratory confirmed. Oysters were considered to be the cause of two separate outbreaks involving 24 people with gastroenteritis. Thirty people were ill in 1999 secondary to consuming oysters. Other shellfish, such as mussels, are generally cooked prior to eating, thereby killing viruses which cause gastroenteritis. Oysters, however, are usually eaten raw.

Viral or suspect viral infections were thought to be the cause of eleven outbreaks of gastroenteritis. These infections can spread rapidly in facilities such as hospitals and residential/nursing care facilities. There were four hospital outbreaks and three in residential/ nursing homes reported during 2000. Of the confirmed viral outbreaks, five were secondary to Small Round Structured Viruses and one outbreak in a child care facility was caused by rotavirus. These viral outbreaks were thought to be caused by person to person spread.

Three outbreaks involved schools with the causative organisms being *Shigella sonnei, E.coli* O157 and SRSV.

Table 1.4: General outbreaks[1] of foodborne illness reported to CDSC (NI) during 2000

Month	Board	Location	Organism	Foodborne outbreaks Suspect vehicle[2]	No. ill[3]	Cases +ve	Evidence
Jan	W	Institution	*C. perfringens*	Chicken curry	61	9	Cohort Study
Feb	N	Hot food take away	*S. enteritidis* PT4	Unknown food	18	12	Descriptive
Mar	E	Restaurant	Unknown*	Infected food handler	37	0	Descriptive
Mar	N	Wine bar	Unknown*	Oysters	13	0	Cohort Study
Dec	N	Ethnic restaurant	Unknown*	Oysters	11	0	Cohort Study

Month	Board	Location	Organism	Other gastrointestinal outbreaks Suspect vehicle[2]	No. ill[3]	Cases +ve	Evidence
Feb	W	Primary school	*Shigella sonnei*	Person/person	14	14	Descriptive
Feb	E	Hospital	SRSV	Unknown	15	0	
Mar	E	Hospital	SRSV	n/a	5	n/a	
Mar	E	Hospital	Unknown*	Person/person	10	n/a	
Mar	S	Residential home	Unknown*	Person/person	24	0	Descriptive
Mar	N	Nursery school	*E coli* O157	Person/person	8	8	Descriptive
Mar/Apr	E	Hospital	SRSV	Unknown	93	4	
Apr	N	Hotel	Unknown*	Unknown	20	n/a	
Apr	E	Nursing home	Unknown*	Person/person	43	0	
Apr	E	Residential Home	SRSV	Person/person	27	1	
Apr	E	Hospital	SRSV	Person/person	30	4	
May	E	County Down	*Cryptosporidium*	Water	n/a	129	Descriptive
May	S	Child Day Care	Rotavirus	Person/person	13	3	Descriptive
Jun	E	Nursery school	SRSV	Person/person	n/a	2	
Aug	E	Lisburn/Poleglass	*Cryptosporidium*	Water	n/a	117	Descriptive
Sep	N	Residential home	Unknown*	Unknown	16	0	

1. General outbreaks involve members of more than one household;
2. Local investigations may not provide conclusive evidence of vehicles of infection. Vehicles are therefore designated 'suspect';
3. The number known to be ill.
* organism not isolated, but outbreak suspected to be viral in origin

Source: CDSC (NI)

References

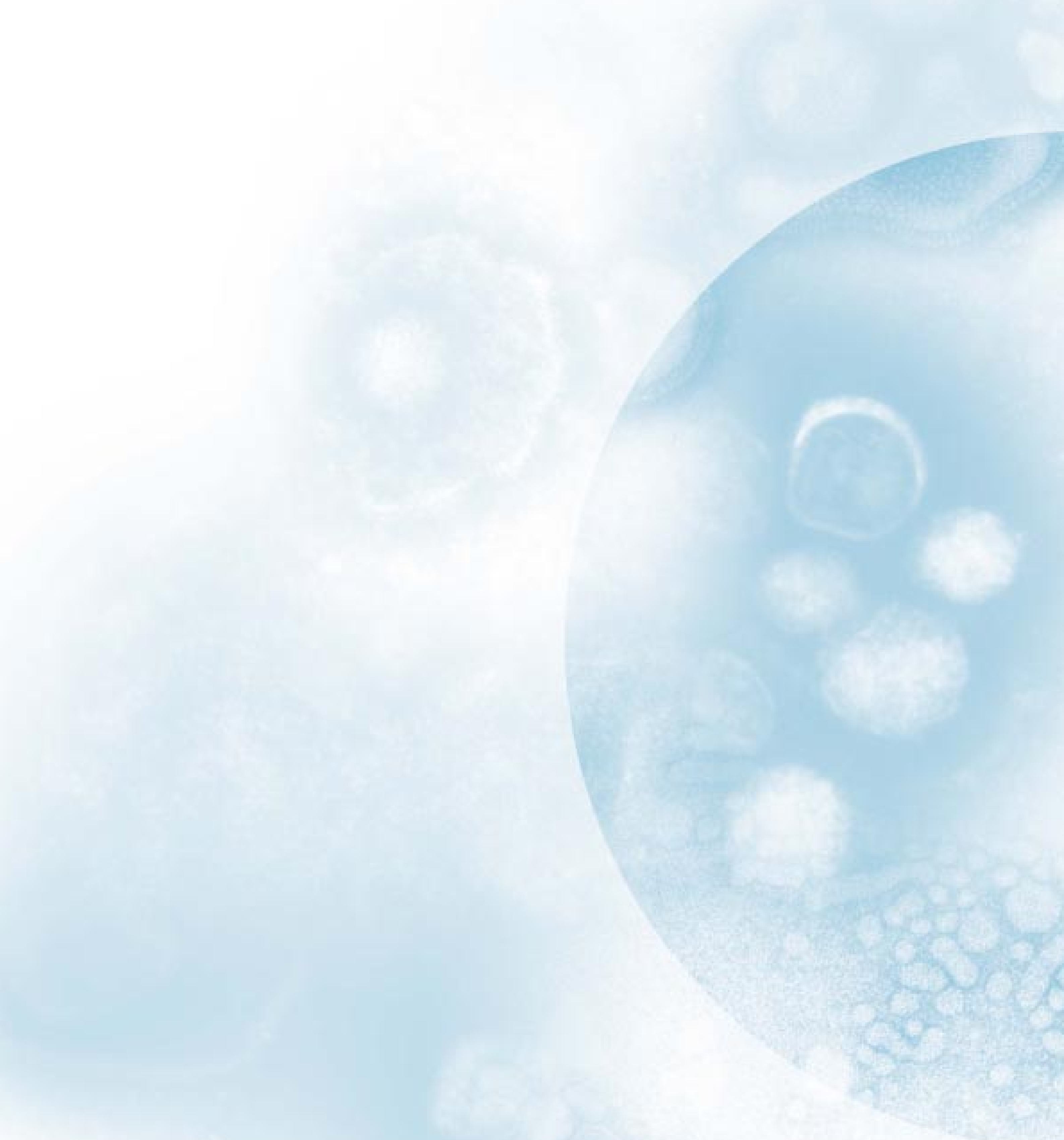
1. Office for National Statistics (2000). Travel Trends - A Report on the 2000 International Passenger Survey. Government Statistical Service. Available at http://www.statistics.gov.uk

2. Federation of Tour Operators (2001). Factfile - Operators and Agents. Available at http://www.fto.co.uk.

3. Department of Health (2001). Health Advice for Travellers. Available at http://www.doh.gov.uk/traveladvice.

Chapter 2

Cryptosporidiosis



Cryptosporidiosis

There were two large waterborne outbreaks of cryptosporidiosis during 2000. Both outbreaks occurred within the Eastern Board area and involved two completely separate water supplies. These outbreaks were associated with considerable gastrointestinal morbidity in the community and were subject to major investigations by an inter-agency Outbreak Control team led by the Eastern Board[1,2].

Cryptosporidium parvum

Cryptosporidiosis is caused by the *Cryptosporidium parvum* parasite which causes profuse watery diarrhoea, abdominal pain and fever. In those with an intact immune system cryptosporidiosis is a self-limiting illness lasting 2-3 weeks. However, in those with an impaired immune system, the clinical course is prolonged, fulminant and can be fatal. It does not respond to antibiotics and, as yet, there is no specific treatment.

Recent research has identified two main types of *C. parvum*. Genotype 1 strains are exclusively associated with infection in humans and genotype 2 strains cause infection in humans and animals. The latter include cattle, sheep, pigs, goats and horses. Transmission of infection to humans is through faecal-oral spread from animals or other humans. Infected calves can excrete vast numbers of cryptosporidial oocysts. For example, 10^{10} oocysts daily for up to 10 days[3]. This can result in widespread environmental contamination. Cryptosporidiosis is very infectious and studies in healthy volunteers have shown that infection can occur with a dose of 30-40 *C. parvum* oocysts[4]. In microbiological terms this is a very small infecting dose and explains how easy it is for infection to be passed from an infected animal or human to others. It can also contaminate food or water potentially putting many at risk of illness.

The public health implications of cryptosporidiosis are the severe illness it causes in those who are immuno-compromised, the lack of any specific treatment and the potential for it to enter drinking water supplies thereby affecting hundreds or thousands of homes and businesses.

Cryptosporidium parvum and water supplies

There have been numerous waterborne outbreaks of cryptosporidiosis reported throughout the world, the largest being Milwaukee in 1993 when 403,000 residents developed gastrointestinal symptoms following contamination of drinking water. In the UK, twenty-five outbreaks of cryptosporidiosis have been associated with the consumption of public drinking water supplies between 1988 and 1998. There have been a series of government reports containing updated information on the epidemiology of cryptosporidiosis and recommendations on the prevention, detection and management of waterborne outbreaks[3,5-6].

Cryptosporidial oocysts can enter water supplies by animal faeces being washed down slopes to reservoirs, particularly after heavy rain or if there is faecal ingress into the mains water supply. The oocysts are resistant to standard chlorine disinfection regimes used for drinking water treatment which would normally kill any pathogenic micro-organisms. Conventional physical/chemical water treatment processes can provide an effective barrier to cryptosporidial oocysts but may not be adequate to deal with a large number of oocysts. Thus it is important to prevent or minimise animal waste from entering water catchment zones by restricting grazing around reservoirs, ensuring the physical integrity of the water distribution system and optimum functioning of water treatment works.

The Bouchier report[3] describes 25 waterborne outbreaks in the UK between 1988-98. It notes that, in 14 outbreaks, there was increased reporting of cryptosporidiosis cases but an absence of oocysts in the water supply. In 11 outbreaks an increase of reported cases was associated with oocysts in water supplies. In addition, there were 18 reports where oocysts were detected in the water supply and no detectable increase in the level of cryptosporidiosis in the community. Thus there is not a simple relationship between the presence and number of oocysts in the water supply and cryptosporidiosis in the community.

A water treatment standard is now being used throughout the UK. This standard requires that there should be less than one oocyst in 10 litres based on continuously sampling 1000 litres of treated water per day. This monitoring is undertaken for those water supplies which, following risk assessment, are deemed to be at moderate-high risk of cryptosporidiosis.

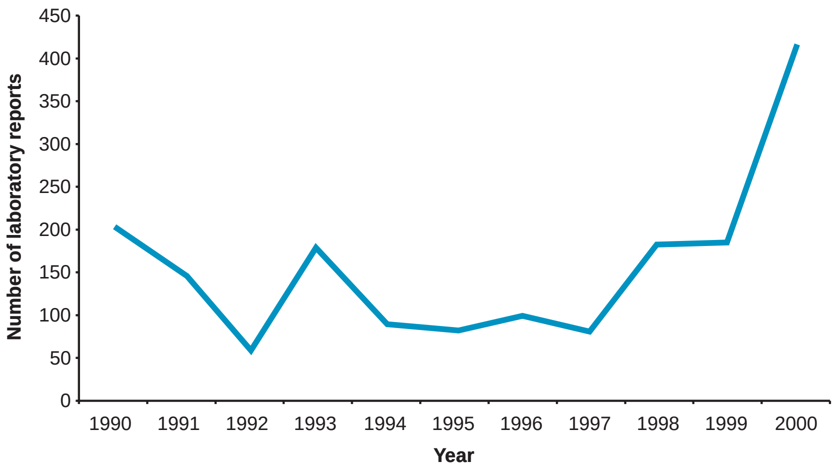
Cryptosporidiosis in Northern Ireland

In 2000, there were 417 laboratory reports of cryptosporidiosis reported to CDSC (NI). This is the highest ever reported annual total (Fig 2.1). It reflects the two Eastern Board outbreaks which accounted for 246 cases (59% of the annual total). Had these two outbreaks not occurred, the resulting total of 171 cases would have been very similar to that reported in 1998-9.

Fig 2.2 describes the rate of cryptosporidiosis within the UK from 1990. Until 2000, rates of laboratory confirmed cryptosporidiosis were greatest in Scotland. However, rates of cryptosporidiosis have been rising in Northern Ireland since 1997 and, in 2000, were the highest in the UK.

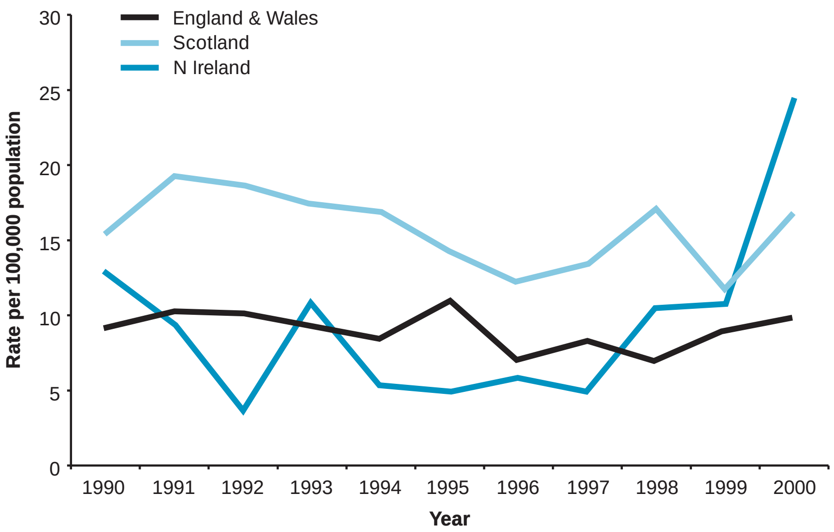
Cryptosporidiosis does not affect all ages equally. Analysis of laboratory confirmed cases reveals that rates of infection are highest in those under five years. However, it should also be noted that parents are more likely to seek medical attention for a child with diarrhoea and it is also more likely that a faecal sample would be obtained for laboratory analysis. This may partially explain the higher rates in children. The two outbreaks in the Eastern Board have different age distributions, which may

Figure 2.1: Laboratory reports of cryptosporidium, 1990 – 2000, Northern Ireland



Source: CDSC (NI)

Fig 2.2: Cryptosporidium isolates per 100,000 population, 1990 – 2000, England & Wales, Scotland and Northern Ireland

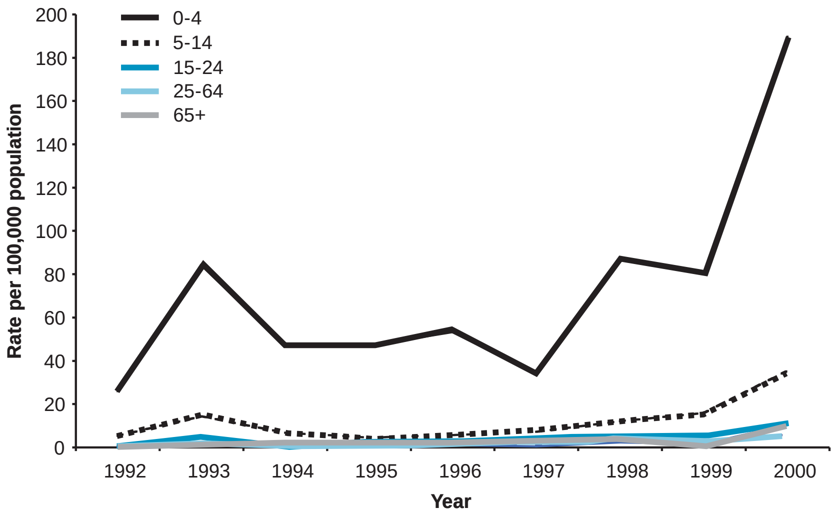


Source: CDSC (Colindale), SCIEH, CDSC (NI)

reflect levels of immunity in the community from previous exposure.

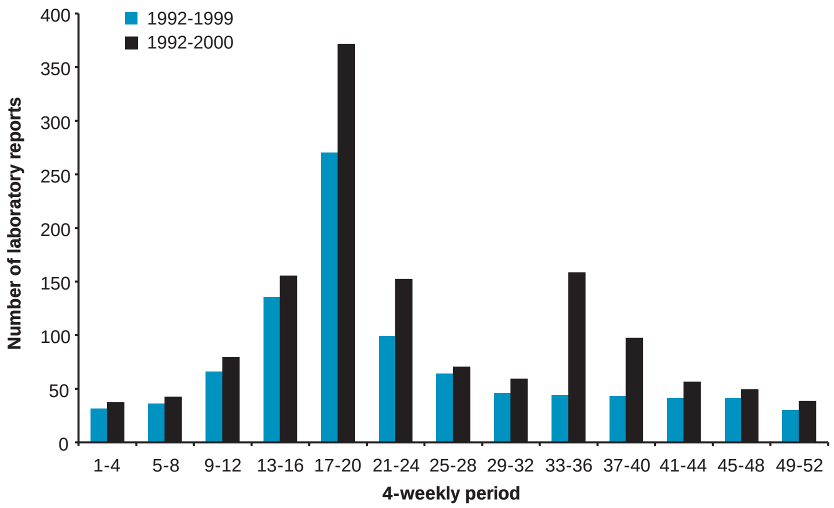
Cryptosporidiosis exhibits a marked seasonal pattern with a rise in the Spring and often a further rise in the Autumn. Fig 2.4 outlines, by four-weekly period, the specimen dates of cryptosporidiosis cases reported to CDSC (NI) between 1992 and 2000. Reports peak during weeks 17-20 (May) even in 'non-outbreak' years. As reports normally increase at this time each year it can be initially difficult to determine if the increase is due to a rise in sporadic reports or whether an outbreak is

Fig 2.3: Cryptosporidium rates by age group, 1992 – 2000, Northern Ireland



Source: CDSC (NI)

Fig 2.4: Cryptosporidium reports by 4 week period, 1992 – 2000, Northern Ireland



Source: CDSC (NI)

occurring. The outbreaks in 2000 in April/May and August/September are particularly evident.

The first outbreak occurred in early May and was particularly associated with clusters of cases in Lisburn, south Belfast and north Down areas. Rates of infection were highest in those receiving water from the Mourne mountains supply. This supply serves approximately 363,000 people. At the conclusion of the outbreak, there were 129 laboratory confirmed cases with 64% being aged under five years of age. The peak onset of illness was 4-6 May. This was approximately seven days after a rise in turbidity (cloudiness) had been noted in that supply distribution. The highest oocyst concentration noted from this supply in the five month period from 1 February was 0.1 oocyst per 10 litre of water (26/27 April) – a level considerably below the treatment standard of 1 oocyst per 10 litre. Oocysts were detected at low levels (range 0.03-0.1 oocysts per 10 litre) over five consecutive days from 26 April-1 May. The laboratory identified *C. parvum* genotype 2 from faecal samples, indicating that the infection could have been from a human or animal source. The Outbreak Control Team concluded that the outbreak was consistent with a bolus of cryptosporidium oocysts in the Mourne supply between 26/28 April, following heavy rainfall in the area.

The second outbreak occurred in August and September on the north-western outskirts of Belfast and was associated with 117 laboratory confirmed cases. Twenty-one individuals were admitted to hospital. All ages were affected but, this time, only 30% were aged under five years of age. The peak onset of illness was 17-18 August and, given an average incubation period of 7-10 days, this suggested that a peak challenge dose of oocysts must have entered the supply around 7-10 August.

Those affected received water from the Lagmore Conduit. This Conduit was built in 1890 and is seven miles long, travelling under agricultural land at depths of 3-25 feet. It supplies a population of approximately 62,000. Detailed investigation by the Water Service, including closed circuit television inspection of the Conduit, identified several potential points of ingress along this elderly structure, one of which was associated with a domestic septic tank. *C. parvum* genotype 1 was identified from cases and from water samples. During the outbreak peak recorded levels were 2.2 oocysts per 10 litre/water on 29-30 August. Genotype 1 implies that the cause was human faecal contamination of the mains water supply.

Residents in the affected area were advised to boil water until a new section of conduit, already constructed, was brought into service. The 'boil water' notice was in force for 20 days (31 August – 19 September).

This was one of the largest 'boil water' notice incidents to have occurred in Northern Ireland, both in terms of the number of people affected by this advice and for its duration. The opportunity was taken after the lifting of the 'boil water' notice to study the extent of gastrointestinal illness within the affected area and how householders responded to the public health advice. A random sample of 3000 households received a postal questionnaire – 1500 from the affected area and 1500 from separate control areas.

The response rate was 33% from the affected area but only 9% from the control area. Key findings included:

- 54% of respondents first became aware of the 'boil water' notice via the media
- 97% of respondents in the affected area remembered receiving the advice leaflet from the Water Service and most were satisfied with the content and layout
- 43% of individuals in responding households from the affected area reported vomiting and/or diarrhoea compared with 12% of individuals in the control area
- 90% of respondents in the affected area stated they boiled all drinking water but 25% continued to use unboiled water every day to brush teeth
- 10 households reported scalds as a result of the 'boil water' notice
- 88% expressed concern in their confidence in the water supply as a result of the outbreak and, at the time of the survey, 38% of households had not returned to their previous levels of consumption of unboiled water. Concerns included inconvenience, additional expense, the increased use of electricity and the risk of scalds
- 19% of individuals sought health advice regarding their illness. The most common source of this advice was the community pharmacist, followed by the GP.

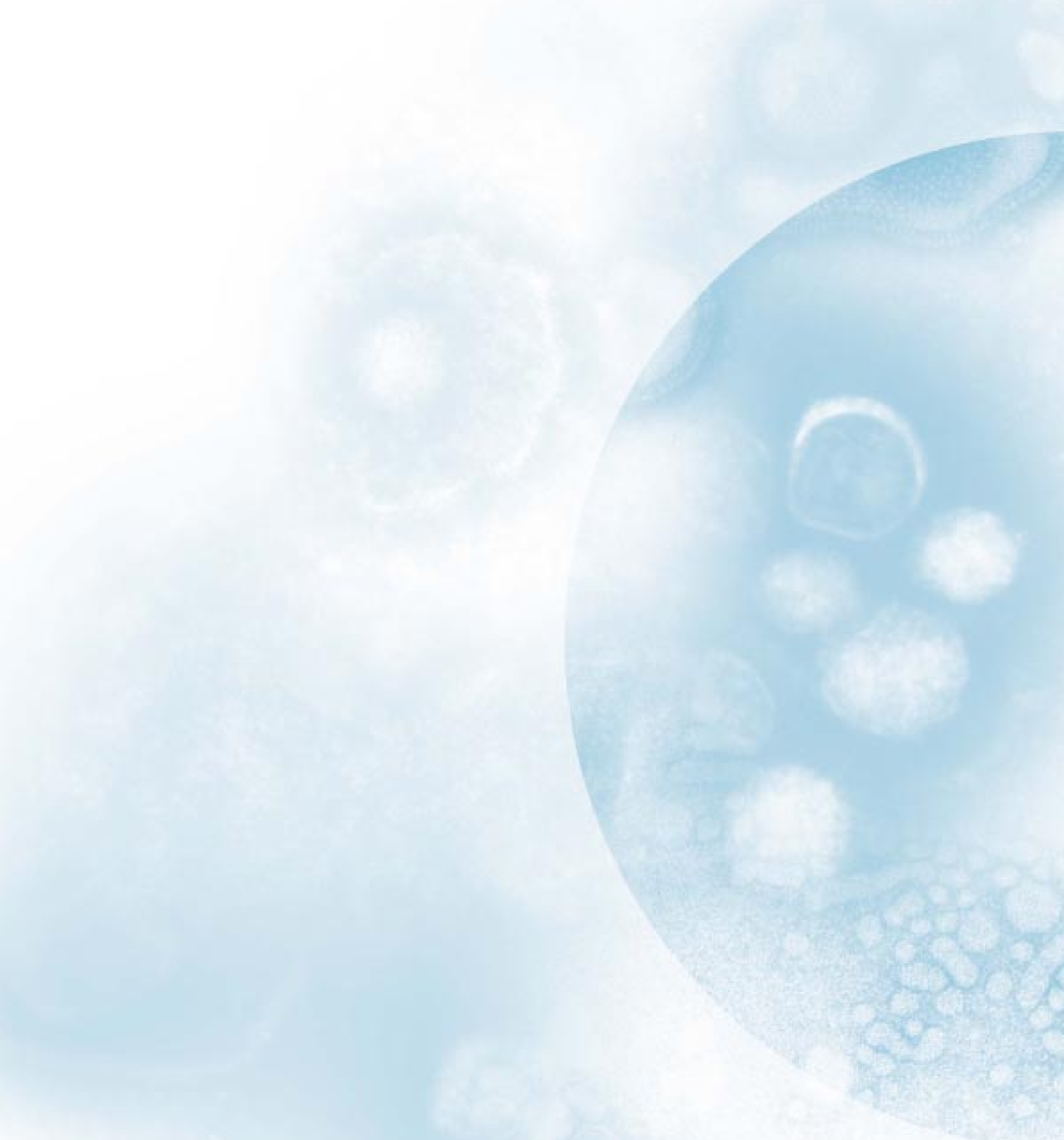
Joint outbreak control plans between Health and Social Services Boards, the Water Service and other agencies, providing a co-ordinated response to waterborne outbreaks of infection, have been in place for many years. The experiences gained from these two outbreaks will further aid development of these inter-agency plans. For example, a multimedia approach is essential when delivering information about a 'boil water' notice. It is also unreasonable to expect thousands of people to strictly adhere to a 'boil water' notice for long periods unless they are continually being kept informed of developments. 'Boil water' notices are not without risk as scalds can and do occur.

References

1. Report of an outbreak of cryptosporidiosis during April and May 2000. Eastern Health and Social Services Board.
2. Report of an outbreak of cryptosporidiosis during August and September 2000 in the Lisburn, Poleglass and Dunmurry areas of the Eastern Board. Eastern Health and Social Services Board.
3. Bouchier I. (1998) *Cryptosporidium* in water supplies: Third Report of the Group of Experts to the Department of the Environment, Transport & the Regions and the Department of Health. London, HMSO.
4. DuPont, HL, Chappell CL, Sterling CR *et al*. The infectivity of *Cryptosporidium parvum* in healthy volunteers. **N Eng J Med** 1995, 332 855-859.
5. Badenoch J. (1990) *Cryptosporidium* in water supplies: Report of the Group of Experts to the Department of the Environment and the Department of Health. London, HMSO.
6. Badenoch J. (1995) *Cryptosporidium* in water supplies: Second Report of the Group of Experts to the Department of the Environment and the Department of Health. London, HMSO.

Chapter 3

Tuberculosis



Tuberculosis

Tuberculosis is the most frequent cause of death due to a single infectious agent, and caused 1.9 million deaths worldwide in 1998[1]. It is caused by organisms of the *Mycobacterium tuberculosis* complex, which includes *M. tuberculosis, M. bovis* and *M. africanum*, of which *M. tuberculosis* is of the greatest public health importance. It is an aerobic, non-spore-forming, non-motile bacillus with a thick cell wall. It is found worldwide, and is of particular importance in less developed parts of the world where incidence rates of disease can be greater than 300 per 100,000 population[2]. In industrialised countries, infection rates are often highest in immigrant populations originating from developing countries.

All three of the organisms mentioned above are capable of causing tuberculosis in humans. Infection can take the form of chronic pulmonary infection, where the organism infects part of the lung and is transmitted by coughing or sneezing. Non-pulmonary tuberculosis is less common than the pulmonary form and can involve any organ or tissue, most commonly bone, lymph nodes, central nervous system, skin and the genito-urinary tract.

If untreated, pulmonary tuberculosis will cause death in around 50% of patients within 5 years, and prior to the introduction of antibiotics such as streptomycin was responsible for one quarter of all adult deaths in Europe[2]. Since the end of the Second World War, the use of antibiotics has caused a steady reduction in deaths.

However, small year-on-year increases in the incidence of tuberculosis have occurred in the UK since 1987-88 and in the USA since 1985. Within the UK, incidence varies widely. It is higher in inner cities and amongst individuals originating from high risk areas such as Africa and the Indian sub-continent. HIV patients are also at a higher risk of infection, and multi-drug resistant strains are becoming more common.

Enhanced tuberculosis surveillance

Clinicians in Northern Ireland, in line with those in the rest of the United Kingdom, are required to notify all cases of tuberculosis to the Director of Public Health of the Health and Social Services Board (HSSB) of residence. Enhanced surveillance of tuberculosis was established in Northern Ireland in 1992 with the introduction of two customised data collection forms (TBS1 and TBS2). TBS1 was designed to collect clinical, demographic and microbiological information, as available at the time of notification. TBS2 is a follow-up surveillance form, which is issued, by the Consultant in Communicable Disease Control (CCDC) in the appropriate HSSB, to the notifying clinician approximately 9 months after initial notification. The purposes of this second form are to collect details of treatment, outcome and further clinical and/or microbiological information not available at the time of notification. All forms are subsequently forwarded to CDSC (NI) where the information is entered onto a secure database, validated, updated and analysed. All notifications are collated into a Northern Ireland dataset which is validated using laboratory reports and anti-microbial resistance information. The information is then used for inclusion in national and European reports, as well as for disease surveillance at a local level. An annual report is prepared for the Regional Tuberculosis Sub-Committee and circulated to microbiologists, chest physicians and those with an interest in tuberculosis.

This report represents the epidemiological data for tuberculosis cases reported in Northern Ireland in 1999.

The sources from which information used in the surveillance programme is taken include enhanced surveillance notification forms, the NI laboratory reporting system, information provided by the UK Mycobacterial Resistance Network (MYCOBNET) and death certifications. All laboratories report a comprehensive list of clinically significant microbiological data to CDSC (NI), including isolates of *Mycobacterium* species. The Northern Ireland Mycobacterial Reference Laboratory, based at the Northern Ireland Public Health Laboratory at Belfast City Hospital, has also been participating in a national system for the surveillance of drug resistance in *Mycobacterium tuberculosis* complex organisms. This scheme, called MYCOBNET, provides information about drug resistant organisms in cases were the organism has been microbiologically confirmed.

Case definitions are based on the recommendations developed by the working group of the World Health Organisation (WHO) and the European Region of the International Union Against Tuberculosis and Lung Disease (IUATLD).

"culture confirmed" case is defined as one in which the diagnosis has been confirmed by culture of *Mycobacterium tuberculosis, M. bovis or M. africanum.*

"non culture confirmed" case is based on a clinical diagnosis of tuberculosis, where the physician has the intention to treat with a full course of anti-tuberculous therapy. Such cases may have been clinically diagnosed and "confirmed" by methods other than culture, e.g. sputum smear or histology.

Both types of cases should be notified through this surveillance system. Any case which subsequently does not fulfil one of the above case definitions is marked as denotified but remains in the dataset. This would include those with diagnosis other than tuberculosis.

Multi-drug resistance (MDR) is defined as resistance to at least isoniazid and rifampicin, with or without resistance to other drugs.

A total of 87 cases were notified through the surveillance scheme during 1999. Among the 87 notifications, two were diagnosed as having other illnesses and 26 were laboratory confirmed as infections with mycobacteria other than tuberculosis (MOTTs). These 28 patients who were either diagnosed with other conditions or infections with MOTTs were de-notified but remained recorded in the dataset. This gave a total of 59 cases of tuberculosis notified during the course of 1999, of which 45 (76%) were culture confirmed. Twelve were notified on the basis of clinical or non-culture diagnosis and response to anti-tuberculous therapy. Two were notified on the basis of post mortem findings. Of the 59 tuberculosis cases, 44 (75%) had pulmonary disease and 15 had non-pulmonary tuberculosis. Follow-up information (either TBS2 or death certificate) was provided for 56 (86%) cases (see Table 3.1).

Table 3.1: Enhanced TB surveillance notification forms submitted by Health and Social Services Board, 1999, Northern Ireland

HSSB	TBS1*	Follow-up*	% TBS1/ follow-up
EHSSB	33	26	79
NHSSB	19	18	95
SHSSB	9	9	100
WHSSB	4	3	75
Total	**65**	**56**	**86**

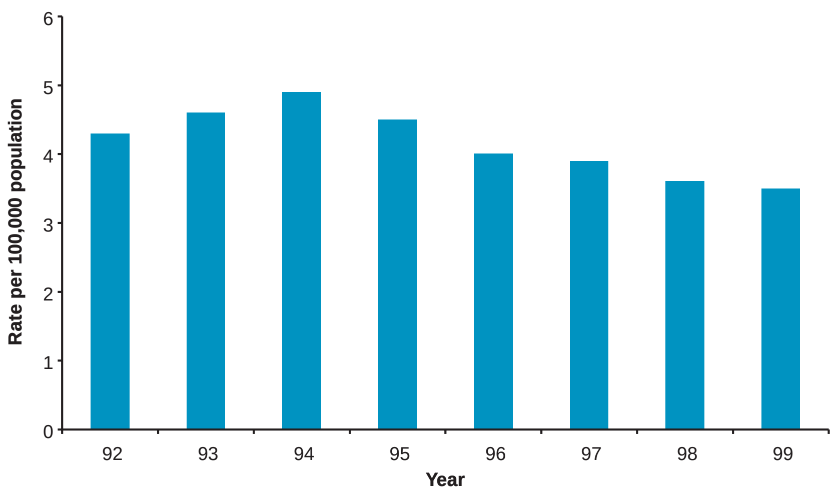
Source: Enhanced Tuberculosis Surveillance, CDSC (NI)

*these figures include death certificates where tuberculosis was implicated as cause of death, clinician's letters and *M. bovis* questionnaires. These questionnaires are carried out by CCDCs in response to laboratory confirmation of *M. bovis* infections.

With a total of 59 notified cases of tuberculosis in 1999, the annual notification rate of tuberculosis for Northern Ireland was estimated at 3.5 cases per 100,000 population. The Eastern Board had the highest annual notification rate for tuberculosis with 5.0 cases notified per 100,000 population (see Table 3.2). This is the lowest incidence rate in Northern Ireland in recent years (see Figure 3.1)

The highest age-specific rate occurred in patients aged 85 years and over for both males and females. The age-specific rate in men was generally higher than that in women, except for the 35-44, 55-64 and 65-74 age-groups (see Figure 3.2). The country of birth was recorded for 54

Figure 3.1 Rate of tuberculosis (all types) notified, 1992-1999, Northern Ireland



Source: Enhanced Tuberculosis Surveillance, CDSC (NI)

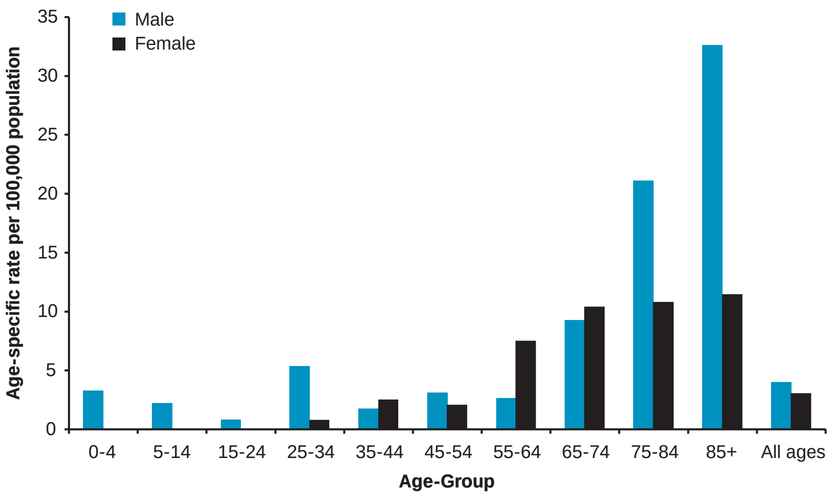
Table 3.2: Tuberculosis cases by Board and case definition, 1999, Northern Ireland

Boards	Culture confirmed	Lab Only*	Non culture confirmed	Total	Rate per 100.000
EHSSB	26	4	8	34	5.0
NHSSB	8	0	3	11	2.6
SHSSB	6	0	3	9	2.9
WHSSB	5	1	0	5	1.8
NI Total	**45**	**5**	**14**	**59**	**3.6**

Source: Enhanced Tuberculosis Surveillance, CDSC (NI)

* "*Lab only*" are those cases for which official notification forms were not received, but laboratory confirmation of infection with *M. tuberculosis* complex organisms was received.

Figure 3.2: Rates of notification of tuberculosis (all types) per 100, 000 population by age and sex, 1999, Northern Ireland



Source: Enhanced Tuberculosis Surveillance, CDSC (NI)

people. Forty-six (85.2%) were born in the United Kingdom, two in Pakistan, one in India and one in Nigeria. The birthplace of the remaining 9 people was either unknown or unrecorded.

Of the 50 cases from whom information was available, seven were reported to have received previous treatment for tuberculosis. In five of these cases, previous treatment was received during the 1940's and 1950's. One case was treated surgically. Only one case, a child, was known to have been identified through contact tracing.

Pulmonary tuberculosis cases

Among the 59 tuberculosis cases, 44 (75%) had pulmonary tuberculosis. Of these 44 cases, 34 (77%) were confirmed by culture. Twenty (45%) of the 44 pulmonary cases were sputum smear positive. All of these were also confirmed by culture. Eight patients with pulmonary TB died. Tuberculosis was registered as the primary or secondary cause of death in five of the cases. It is not known if tuberculosis was responsible for or contributed to death of the remaining cases.

The annual notification rate for pulmonary tuberculosis in Northern Ireland was 2.6 cases per 100,000 inhabitants (see Table 3.3). The Eastern Board had the highest annual notification rates for pulmonary tuberculosis with 4.1 cases per 100,000 population.

The age-sex distribution shows that the highest age-specific rate occurred in the over 85 age-group for both sexes (Figure 3.3).

Non-pulmonary tuberculosis cases

Altogether 15 notifications of non-pulmonary tuberculosis were received, twelve of which were culture-confirmed.

The sites of disease were:

Site	No. of cases
Lymph nodes	8
Genito-urinary	1
Pleura	1
Unknown	2

None of the patients are known to have died.

The annual notification rate for non-pulmonary tuberculosis was 0.9 cases per 100,000 inhabitants. Rates in all four Boards were very similar (see Table 3.4).

The highest age-specific rate for males was in the 25-34 age-group and for females in the 65-74 age-group. The highest age-specific rate overall occurred in the 65-74 age-group (see Figure 3.4).

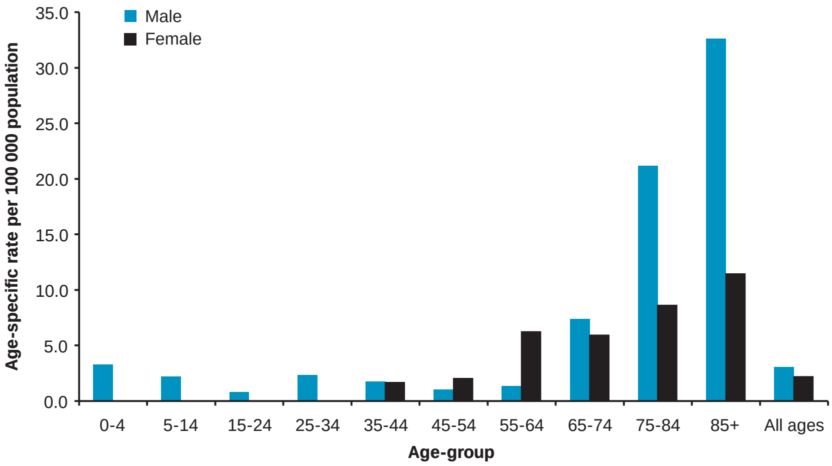
Table 3.3: Pulmonary tuberculosis notifications by HSSB and case definition, 1999, Northern Ireland

Board	Culture confirmed	Lab only*	Non culture confirmed	Total	Rate per 100.000
EHSSB	22	3	6	28	4.1
NHSSB	5	0	3	8	1.9
SHSSB	5	0	1	6	1.9
WHSSB	2	0	0	2	0.7
NI total	**34**	**3**	**10**	**44**	**2.6**

* "*Lab only*" are those cases for which official notification forms were not received, but laboratory confirmation of infection with *M. tuberculosis* complex organisms was received.

Source: Enhanced Tuberculosis Surveillance, CDSC (NI)

Figure 3.3: Rates of notification of pulmonary tuberculosis per 100,000 population by age and sex, 1999, Northern Ireland



Source: Enhanced Tuberculosis Surveillance, CDSC (NI)

Table 3.4: Non-pulmonary tuberculosis notifications by HSSB and case definition, 1999, Northern Ireland

Board	Culture confirmed	Lab only*	Non culture confirmed	Total	Rate per 100,000
EHSSB	5	1	1	6	0.9
NHSSB	3	0	0	3	0.7
SHSSB	1	0	2	3	1.0
WHSSB	3	1	0	3	1.1
NI total	**12**	**2**	**3**	**15**	**0.9**

Source: Enhanced Tuberculosis Surveillance, CDSC (NI)

* "*Lab only*" are those cases for which official notification forms were not received, but laboratory confirmation of infection with *M. tuberculosis* complex organisms was received.

Anti-tuberculous treatment

Initial therapy

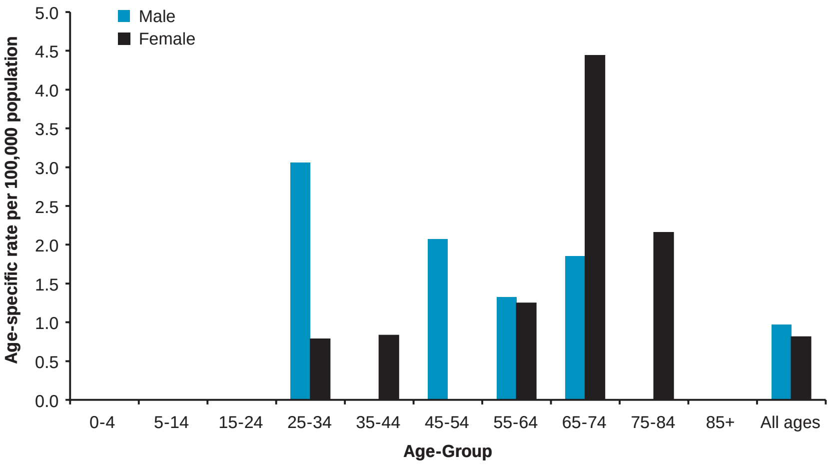
Initial therapy was recorded for 35 (59.3%) patients. The most commonly reported treatment regimen was a combination of rifampicin, isoniazid and pyrazinamide (see Table 3.5).

Continuation therapy

Continuation therapy was recorded for 34 (58%) of the cases. The most commonly reported treatment regimen was a combination of rifampicin and isoniazid (see Table 3.6).

Adverse drug reactions were recorded in nine cases (22.5% of cases for which initial therapy details were recorded). Hepatotoxicity was reported in three cases who were being treated with rifampicin, pyrazinamide and isoniazid. Rifampicin was described as producing toxic allergic reactions in two cases. A rash due to reaction to pyrazinamide was reported in two cases. An exacerbation of gout was reported in one case and an increase in uric acid levels was reported in another.

Figure 3.4: Rates of notification of non-pulmonary tuberculosis per 100,000 population by age and sex, 1999, Northern Ireland



Source: Enhanced Tuberculosis Surveillance, CDSC (NI)

Table 3.5: Initial therapies employed for the treatment of tuberculosis, 1999, Northern Ireland

Initial therapy	Number of cases
Isoniazid/Rifampicin/Pyrazinamide/Ethambutol	1
Isoniazid/Rifampicin/Pyrazinamide	27
Isoniazid/Rifampicin	1
Isoniazid/Rifampicin/Ethambutol	4
Isoniazid/Pyrazinamide/Ethambutol	1
Rifampicin/Ethambutol/Streptomycin	1

Source: Enhanced Tuberculosis Surveillance, CDSC (NI)

Table 3.6: Continuation therapies employed for the treatment of tuberculosis, 1999, Northern Ireland

Continuation therapy	Number of cases*
Isoniazid/Pyrazinamide	2
Isoniazid/Rifampicin	28
Pyrazinamide/Ethambutol	2

*in two cases, only duration of therapy was known

Source: Enhanced Tuberculosis Surveillance, CDSC (NI)

Non-tuberculosis cases

Twenty six cases were later found to be due to MOTTs and so were excluded from the main analysis. The mycobacterial species breakdown was as follows:

Organism	No. of reports
M. avium-intracellulare	12
M. malmoense	7
M. kansasii	6
M. scrofulaceum	1

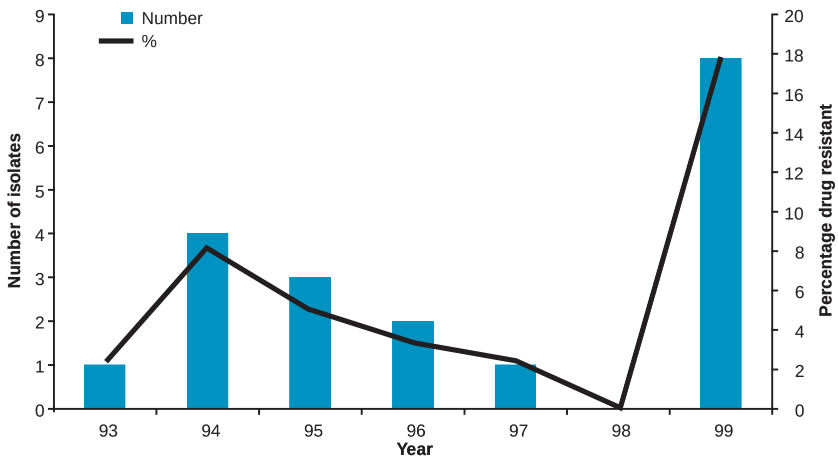
Surveillance of mycobacterial isolates susceptibility to anti-tuberculous drugs

In 1999, 49 isolates of *M. tuberculosis* complex were examined, of which 45 were clinical cases confirmed during this period. Resistance was recorded in 8 (18%) cases. Three isolates were resistant to pyrazinamide (all *M. bovis*), two were resistant to isoniazid (*M. tuberculosis*), two were resistant to streptomycin (*M. tuberculosis*) and one was resistant to both pyrazinamide and isoniazid (*M. bovis*). Three of the patients from whom these organisms were isolated were not born in the United Kingdom; countries of birth were supplied as India, Pakistan and Nigeria. All isolates from these patients were *M. tuberculosis.*

Data on seven of these cases were provided by MYCOBNET. Information on the remaining case was obtained from the PHLS Mycobacterium Reference Unit and Regional Centre for Mycobacteriology in Dulwich. This level of resistance is high when compared to recent years (see Figure 3.5), but is partially due to the three *M. bovis* isolates which often exhibit resistance.

Although notification rates for tuberculosis in several European countries, including Republic of Ireland, England and Wales, showed a marked increase during the late 1980's and early 1990's, a similar trend has not been observed in Northern Ireland. Several studies have attributed the increase to changing socioeconomic conditions, incidence of HIV infection and AIDS and to association with higher risk minority groups, some of whom may be recent immigrants from endemic areas.

Figure 3.5 Incidence of drug resistance in isolates of *M. tuberculosis* complex organisms, 1993-1999, Northern Ireland



Source: Enhanced Tuberculosis Surveillance, CDSC (NI)

Between 1988 and 1992, an overall 12% increase in incidence of tuberculosis was observed in England and Wales, with the largest increase occurring in the most socioeconomically deprived 30% of the community[3]. Such effects are much less pronounced in Northern Ireland, with lower levels of HIV infection and a lower proportion of ethnic groups in the population. This may in part explain why a similar increase in tuberculosis notifications has not been observed, and why the rate of notification continues to remain at similar levels for the past 10 years.

The overall rate of notification of tuberculosis in Northern Ireland in 1999 was 3.5 per 100,000 population, and therefore remains at a similar level to previous years. No clusters were reported in 1999 and cases were distributed all over Northern Ireland, as was the case in previous years. The rate of notification compares to a crude rate of 12.9/100,000 population in the Republic of Ireland[4] and 10.8/100,000 in England and Wales[5] during the same period. This overall rate also compares favourably to most other countries in Europe, with notification rates of 100+/ 100,000 being reported in some countries during 1998[6]. Although tuberculosis is not considered a major communicable disease problem in Northern Ireland, changing disease patterns and epidemiology in demographic groups observed elsewhere, and particularly in England and Wales, indicate the importance of functional and informative surveillance strategies. The predictive value of surveillance systems may well be tested in the future.

Antibiotic resistance in eight isolates in one year is unusually high, although only one isolate (*M. bovis*) exhibited resistance to two antibiotics. During 1998, none of the isolates expressed resistance to any of the first-line anti-tuberculous antibiotics[7]. It is perhaps significant that higher levels of resistance are beginning to appear in Northern Ireland somewhat later than in the rest of the UK. Northern Ireland is a relatively closed community with lower levels of immigrants, and generally less movement of people. Only one multi-drug resistant organism has been detected in Northern Ireland in 1995, and none have been reported since then. Two multi-drug resistant isolates were reported in ROI in 1999, and it will be important to remain vigilant and to employ measures to limit the potential spread of such organisms in the island and the Province.

England and Wales will be developing outcome surveillance for cases notified after 1 January 2002. Northern Ireland has had outcome surveillance in place since 1992, but in order to compare and contrast future tuberculosis outcome information with other parts of the UK, it will be necessary to amend the TBS2 data collection form. This will provide additional valuable information such as the proportion of those with tuberculosis who have been successfully treated.

References

1. World Health Organisation (2001). Global Tuberculosis Control. Geneva, WHO.

2. World Health Organisation (1997). World Health Organisation Report on the Tuberculosis Epidemic. Geneva, WHO.

3. Bhatti N, Law MR *et al*. Increasing incidence of tuberculosis in England and Wales: a study of the likely causes. **Brit Med J**, 1995, 310 967-969.

4. Smith A, Igoe D et al. (2000). National Report on the Epidemiology of TB in Ireland, 1999. Dublin, National Disease Surveillance Centre. Available at www://ndsc.ie/Publications/Tuberculosis.

5. Gatto A (2001). Enhanced Tuberculosis Surveillance in England, Wales and Northern Ireland. Report on cases notified in 1999. London, PHLS CDSC.

6. EuroTB (InVS/KNCV) and the national coordinators for tuberculosis surveillance in the WHO European Region (2001). Surveillance of Tuberculosis in Europe. Report on tuberculosis cases notified in 1998. France/The Netherlands, EuroTB (InVS/KNCV).

7. Bonmarin I (1998). Surveillance of tuberculosis in Northern Ireland in 1998. Belfast, CDSC (NI).

Chapter 4

Meningococcal Disease

Meningococcal Disease

Meningococcal disease is a major worldwide cause of morbidity and mortality caused by bacteria of the species *Neisseria meningitidis*, of which there are thirteen serogroups. The most important of these are the serogroups A, B, C and W135, which differ primarily in the structure of their capsules or outer envelopes. All serogroups are capable of causing disease in susceptible individuals, and attack rates depend on many variables. Although the disease can affect any individual at any time of the year, in Europe incidence tends to increase notably during the winter months. In Western Europe and most industrialised countries, serogroups B and C cause the majority of disease, with other serogroups, like W135, Y and 29E being responsible for a small number of cases of meningococcal disease. Serogroup B was responsible for approximately 60% of cases in the United Kingdom and Ireland, with serogroup C accounting for around 30-35% of cases prior to the introduction of the meningococcal C conjugate (Men C) vaccine. Serogroup A, along with certain strains of serogroup C, predominate in third world countries, particularly sub-Saharan Africa.

Many people carry strains of *Neisseria meningitidis* in their nasopharynx without ever developing invasive disease. It has been estimated that around 10% of all age-groups and as many as 20-25% of 18-24 year olds harbour the organism[1]. The reasons which cause asymptomatic carriage to progress to invasive disease are not well understood and involve many different factors. Meningococcal disease can have many clinical manifestations, including meningitis, encephalitis and acute bacterial sepsis. Common symptoms of infection in children include neck stiffness, dislike of bright lights (photophobia), a rash which does not disappear on pressure, lethargy and loss of consciousness. In adults, the disease is characterised by sudden onset of fever, intense headache, petechial rash, photophobia, nausea and vomiting. Diagnosis of the disease is based on clinical findings and microbiological confirmation using tests such as culture, serology and polymerase chain reaction (PCR). Treatment with antibiotics has resulted in improvements in case fatalilty rates (CFR), which historically were as high as 50%[2]. CFR in some European countries can still be as high as 30.1%[3]. Most patients survive, although around 1 in 8 may develop complications such as hearing difficulties or require limb amputation. In England and Wales, young people under 18 years old are most frequently affected by the disease, particularly under 5's[1]. The prognosis is best in those with the meningitic form of the disease.

The increasing incidence of serogroup C in recent years prompted the introduction of the Men C vaccine in the UK in November 1999. This has had a major impact on the epidemiology of meningococcal infection in those aged under 18 years, with a marked reduction in reports of group C infection.

This report describes the findings of the enhanced surveillance of meningococcal disease programme for 2000, and for the epidemiological year 1 July 2000 to 30 June 2001, particularly in the light of the Men C vaccination programme.

Enhanced surveillance of meningococcal disease

Enhanced surveillance of meningococcal disease (ESMD) commenced in England and Wales in 1998, and was introduced to Northern Ireland in 1999. The system facilitates complete ascertainment of all cases of meningococcal disease, including those with a clinical diagnosis only. It also involves the collation of supplementary information which allows the identification of fatalities and clusters, and monitoring of the impact of the Men C vaccination programme.

Case definitions are as follows:

Confirmed case:

Final diagnosis of meningitis, septicaemia or other invasive disease
AND
Isolation of *N. meningitidis* from a normally sterile site or rash aspirate
OR
Gram negative diplococci in a normally sterile site
OR
Meningococcal DNA in a normally sterile site or rash aspirate
OR
Meningococcal antigen in blood, CSF or urine
OR
>4-fold rise in IgG antibody to C-polysaccharide

Probable case:
Final clinical diagnosis of meningitis or septicaemia or other invasive disease where meningococcal disease is considered the most likely diagnosis by the CCDC and the physician managing the case.

Table 4.1 ESMD: cases and rate per 100,000 persons and per Board, 2000, Northern Ireland

Board	Population*	Confirmed	Rate	Probable	Rate	All cases	Rate
EHSSB	673,400	48	7.1	16	2.4	64	9.5
NHSSB	430,500	45	10.5	28	6.5	73	17.0
SHSSB	311,900	15	4.8	14	4.4	29	9.3
WHSSB	282,000	27	9.6	14	5.0	41	14.5
Northern Ireland	**1,697,800**	**136**	**8.0**	**72**	**4.2**	**208**	**12.3**

*2000 mid-year population estimates, Northern Ireland Statistics Research Agency

Source: CDSC (NI) Enhanced Surveillance of Meningococcal Disease

Calendar year 2000

In 2000, notifications of meningococcal disease were received for 208 persons, giving an incidence rate of 12.3 cases per 100,000 population. This compares with an incidence rate of 8.9 per 100,000 population for England and Wales over the same period.

The highest rate of notification was seen in the Northern Board (17.0 per 100,000 population). This figure is unexpectedly high and can be partly attributed to a high rate of notified probable cases (6.5 per 100,000 population) (see Table 4.1)

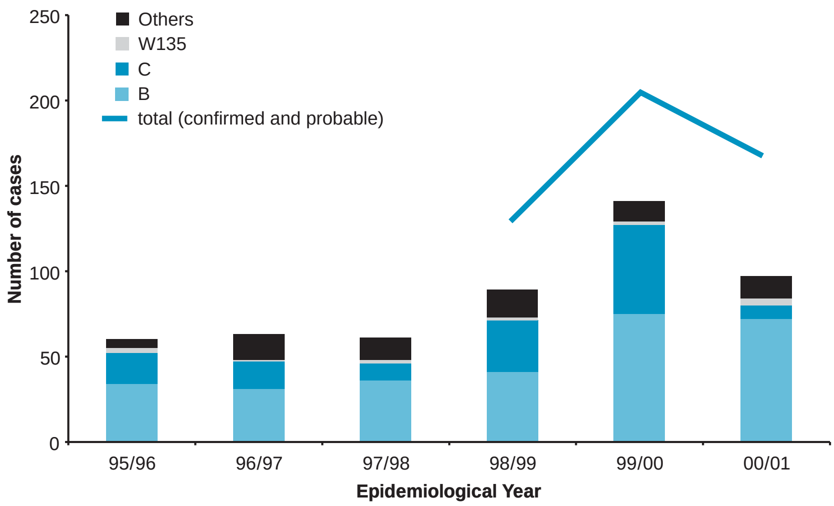
Of the 208 notifications, one hundred and thirty six cases (65.4%) were microbiologically confirmed. This compares with a confirmation rate in 1999 of 58.5%. Of the confirmed cases in 2000, serogroup B accounted for 61.0% of all cases, with serogroup C accounting for 26.5%. This represents an increase in the proportion of serogroup B cases, which has also been reported for England and Wales. The increased use of (PCR) for the diagnosis of meningococcal disease has contributed to the increase in the proportion of all confirmed cases. For example, in 1999, 42.1% of all confirmed cases were diagnosed solely by PCR, whereas this figure increased to 56.7% in 2000.

Analysis of the 2000/2001 epidemiological year

Between 1 July 2000 and 30 June 2001, 167 notifications of invasive meningococcal disease were received through the ESMD programme. This gives rise to a notification rate of 9.8 per 100,000 population, compared with a rate of 7.7 per 100,000 population for England and Wales over the same period.

Ninety-seven (58.0%) cases have been laboratory confirmed. Seventy-two (74.2%) have been identified as serogroup B, 8 (8.2%) as serogroup C and 17 (17.5%) were ungrouped or identified as other serogroups. This compares with a total of 203 notifications and 141 (69.5%) confirmed cases for the previous epidemiological year (see Figure 4.1). This represents a reduction of 18.2% in notification rates. The peak of winter

Figure 4.1: Annual total of meningococcal disease by epidemiological year and serogroup, 1995-2001, Northern Ireland



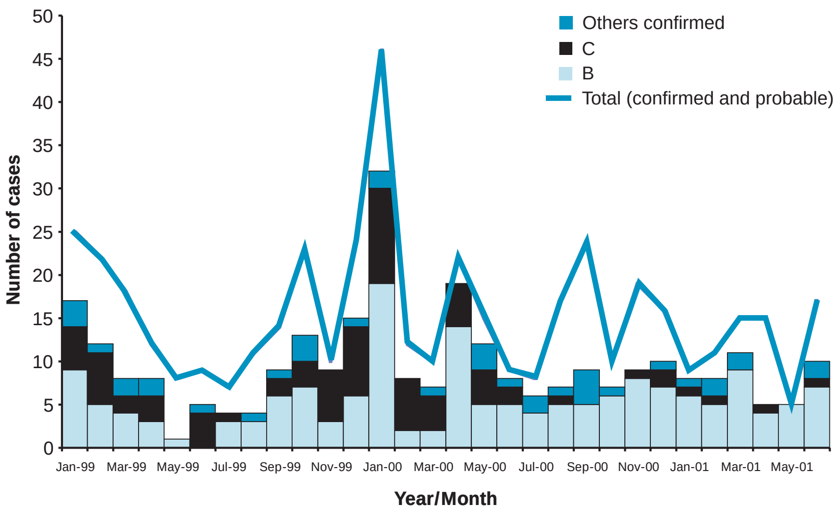
-ESMD commenced in 1999; therefore numbers of probable bases were only available after this time.

Source: CDSC (NI) Enhanced Surveillance of Meningococcal Disease activity seen in the previous epidemiological year was not observed (see Figure 4.2). There have been no reports during the epidemiological year 2000/2001 of any individuals with confirmed serogroup C infections who were known to have been vaccinated with the Men C vaccine.

Nine deaths occurred in the 12-month period. This compares with 5 deaths for the period July 1999 to June 2000. This higher number of deaths results in a higher case fatality rate; however, a lower rate has been seen in the epidemiological year 99/00 than had been seen in previous years. It is noteworthy that there have been two laboratory reports of W135 in the first half of 2001, and both cases have been fatal. Analysis of case details from fatal cases over the last three epidemiological years indicates that septicaemic infections are more likely to result in death. It would also appear that adults have accounted for more fatalities during the most recent epidemiological year. For example, the median age of fatality has increased from 10 months in the epidemiological year 1999/2000 to 22 years in 2000/2001.

Overall rates and age-specific rates per 100,000 population for all age-groups have been reduced since the previous epidemiological year (see Table 4.2). It is particularly notable that there have been reductions in serogroup C infections in all age-groups, except for persons in the 18-24 age-group where the rate remains unchanged. There have been no reports of serogroup C infection in children under two years during the epidemiological year 2000/2001. Also,

Figure 4.2 Monthly cases of meningococcal disease by serogroup, January 1999-June 2001, Northern Ireland



Source: CDSC (NI) Enhanced Surveillance of Meningococcal Disease

Table 4.2 Age-specific rates of invasive meningococcal disease due to serogroups B and C, 1995-2001, and percentage change between 1999/2000 and 2000/2001, Northern Ireland

Serogroup B	95/96	96/97	97/98	98/99	99/00	00/01	% change
0-2	32.0	27.8	26.4	33.4	58.4	48.6	-16.8
3-4	8.3	8.3	8.3	6.2	18.6	18.6	0.0
5-14	1.1	0.8	1.9	2.3	3.0	5.7	90.0
15-17	1.3	2.6	1.3	5.1	5.1	5.1	0.0
18-24	0.0	0.0	0.0	0.6	3.1	3.7	19.4
>24	0.1	0.2	0.7	0.3	0.7	0.3	57.1
All ages, incl unknown	2.1	1.9	2.1	2.4	4.4	4.2	-4.5
Serogroup C	**95/96**	**96/97**	**97/98**	**98/99**	**99/00**	**00/01**	**% change**
0-2	6.9	5.6	5.6	12.5	20.8	0.0	-100.0
3-4	6.2	2.1	2.1	10.3	20.6	2.1	-89.8
5-14	2.3	2.3	0.4	3.0	3.8	0.4	-89.5
15-17	0.0	1.3	2.6	2.6	5.1	0.0	-100.0
18-24	1.8	1.2	0.0	3.1	2.5	2.5	0.0
>24	0.1	0.2	0.2	0.1	0.8	0.2	-75.0
All ages, incl unknown	1.1	1.0	0.6	1.8	3.1	0.5	-83.9
All confirmed	**95/96**	**96/97**	**97/98**	**98/99**	**99/00**	**00/01**	**% change**
0-2	43.1	40.3	41.7	63.9	87.6	62.5	-28.7
3-4	14.5	16.5	14.5	22.7	43.4	26.8	-36.2
5-14	3.8	4.2	3.0	5.3	7.9	6.0	-24.1
15-17	2.6	7.7	3.8	7.7	11.5	6.4	-44.3
18-24	3.1	1.2	0.6	4.3	6.8	6.2	-8.8
>24	0.2	0.5	1.0	0.5	1.4	0.7	-50.0
All ages, incl unknown	3.6	3.8	3.6	5.3	8.3	5.7	-31.3

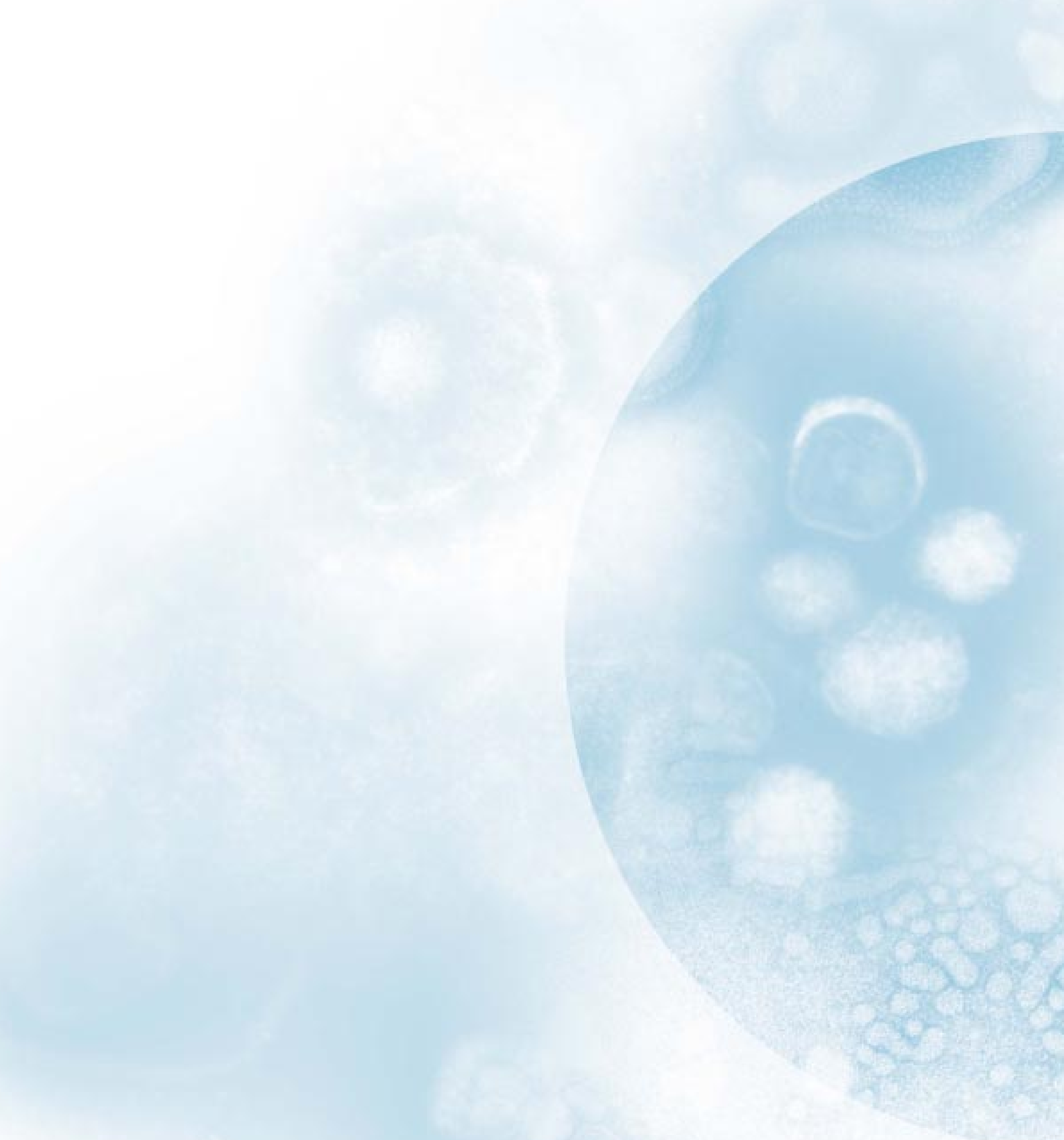
Source: CDSC (NI) Enhanced Surveillance of Meningococcal Disease although the overall rate of serogroup B infection has reduced, an increase in rate has been observed in 5-14 year olds and adults aged over 24 years. Vaccination has also had a favourable effect on the rates of meningococcal disease in the UK. It is important to note that no vaccine is currently available for protection against serogroup B disease, and, as its incidence in children and young adults continues to increase, clinicians and the general public must remain alert to the fact that the disease continues to be of major public health concern.

References

1. Cartwright, K Meningococcal carriage and disease *in* Cartwright K (editor): *Meningococcal Disease*. London: John Wiley and Sons, 1995.
2. Chin, J (editor): Control of communicable disease manual. USA, American Public Health Association, 2000
3. Noah N and Henderson B (2000). Surveillance of bacterial meningitis in Europe 1998/99. London, PHLS CDSC.

Chapter 5

Influenza



Influenza

Influenza (flu) is caused by the influenza virus, of which three main types are recognised: A, B and C. These types differ in their structure, host range and clinical features. Strains of types A and B are responsible for most flu seen each year, though the proportion caused by each type can vary from winter to winter. Although there will be a number of cases at any time during the year, a significant rise in virus activity is frequently observed during the winter months in temperate countries like the UK. The exact timing and severity of the peak can vary from winter to winter. Most national epidemics and global epidemics (pandemics) are caused by type A viruses, and they may be responsible for significant mortality. In the UK there is almost always a rise in the activity of an influenza A virus at some point during the months November to April. Type B viruses increase in activity most winters, but tend to cause small outbreaks during lulls of influenza A activity. They are not normally responsible for pandemics, and only cause mortality in high-risk patients such as the elderly and the immunocompromised. Type C viruses cause much milder episodes of disease and shows no seasonality. Attack rates of influenza virus during outbreaks can reach levels of 10-40 % over a 5-6 week period of peak activity.

Influenza is an acute viral disease of the respiratory tract which can cause a wide range of symptoms, including fever, myalgia, headache, coryza, sore throat and cough. Onset is rapid after an incubation period of 1-3 days. Such clinical symptoms are common to a wide range of viral infections of the upper respiratory tract, and hence patients may be described as having flu or flu-like illness. It is difficult to predict when the peak of an outbreak will occur, which strains will be responsible, and who will be worst affected. Infection is spread by person-to-person contact, and inhalation of the virus, facilitated by an often long-lasting cough and discharges from the mouth and nose.

Most people recover from flu in 2-7 days, though any associated cough may be more prolonged and complications can develop. Very few people die directly from influenza infection, but mortality is increased in those who develop complications such as chest infections, pneumonia and cardiac problems. This increase in morbidity is more commonly seen in patients who are already immunocompromised and have chronic conditions, such as those with diabetes, chronic heart and respiratory disease or metabolic disorders. In addition, the morbidity caused by the rapid spread of influenza results in a further strain on resources in both primary and secondary healthcare sectors.

Winter 2000-2001: enhanced surveillance of influenza in Northern Ireland

The Enhanced Surveillance of Influenza in Northern Ireland (ESINI) commenced in September 2000 as a pilot study for community-based influenza surveillance. It involved the weekly compilation of consultation-based information regarding flu and flu-like illness from sixteen general practices (spotter practices) from across the Province (seven from EHSSB, six from NHSSB, two from SHSSB and one from WHSSB).

The practices involved in the scheme have computer systems on which is recorded information including consultations, prescriptions, chronic conditions etc. The data can be entered using a coding system so that information about specific diseases, infections, conditions, drugs etc can be easily retrieved. This forms the Data Retrieval Project managed by the Queen's University of Belfast Department of General Practice. When a patient presents to their doctor with symptoms of flu or flu-like illness, this will be recorded in the patient's chart using a particular code. Searches are then carried out on a weekly basis for the number of entries of the particular code during the preceding week. The data are then forwarded to CDSC (NI) where they are collated, analysed and included in a weekly report which is distributed to DHSSPS, Boards, Trusts, participating practices and others with an interest in influenza surveillance. The principal aim of the project is to provide early warning of influenza virus circulation in Northern Ireland.

A number of practices were also involved in enhanced virological surveillance, whereby clinicians took nasal and throat swabs from patients presenting with the clinical symptoms of influenza. These swabs were then tested for the presence of influenza virus.

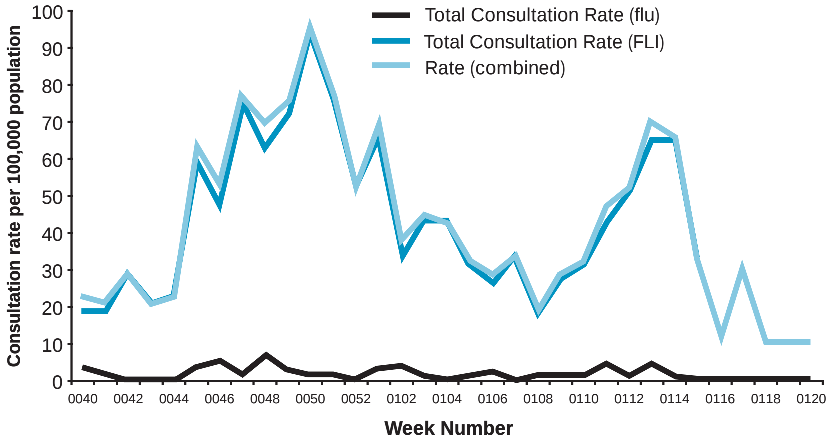
The objectives of the scheme are to supplement the surveillance data already available through routine laboratory testing. Many of those who suffer from influenza will self-medicate, or may visit or contact their GP if their symptoms are more severe. It is unlikely that samples would be taken from such individuals for laboratory testing. Consequently, most samples which are tested by the laboratory originate from patients who have taken ill, become hospitalised due to an underlying condition such as diabetes or cardiorespiratory disease, or who have developed complications. By the time samples have been taken from such patients for laboratory testing, virus will have been circulating in the community for several weeks. To increase the predictive value of surveillance, it is important that more timely and representative information is retrieved. Such data could be used in the planning of resources in primary and secondary healthcare, and, in turn, reduce the pressures on healthcare systems, healthcare staff and patients.

Consultation rates for flu and flu-like illness

Consultation rates for influenza remained at low levels during the season of 2000-2001 (see Figure 5.1). A peak rate of 6.8 per 100,000 population was seen in week 48 (early December), and the average rate was 1.7 per 100,000 population.

Since this is the first year of surveillance, no baseline level of activity is available. This baseline level will be calculated once data for several seasons becomes available.

Figure 5.1 GP consultation rates for flu and flu-like illness (FLI) by week number, 2000-2001, Northern Ireland



Source: CDSC (NI) Enhanced Surveillance of Influenza

Consultation rates for flu-like illness (FLI) ranged from 9 to 93.9 per 100,000 population. Rates increased from the beginning of the surveillance period and reached a peak in week 50, before decreasing to 18.3 per 100,000 in week 8. Subsequently a further rise was seen which peaked at 64.8 per 100,000 in weeks 13 and 14. Rates continued to drop steadily until the end of the surveillance period in week 20 (see Figure 5.1).

Throughout the surveillance period, consultation rates for FLI remained much higher and more variable than those for influenza. The low consultation rates for influenza reflect the low levels of influenza activity observed throughout the UK and Ireland. Rates of consultation for FLI probably reflect activity of several respiratory viruses in the community.

Virus activity in Northern Ireland

The 2000-2001 influenza season was much less severe than those seen in recent years, and routine laboratory reporting most closely followed the trends and levels observed in the 1997-1998 season. This year, because of the enhanced surveillance programme, an additional source of virological data was available. The findings are outlined below.

Virological surveillance in the community

Eleven GP surgeries were involved in an enhanced study which entailed nasal and throat swabbing of patients presenting with clinical influenza.
A total of 81 swabs were submitted by GP spotter practices during the season 2000-2001. These were tested for the following viruses which are common

causes of respiratory tract illness: influenza A H1N1, influenza A H3N2, influenza B, rhinovirus, adenovirus and parainfluenza virus. Twenty-seven were positive and two samples were duplicated, bringing the total number of patients who tested positive to twenty-five. Twelve of these were positive for influenza virus, all of which were influenza A H1N1. In two of the twelve cases, the swabs also tested positive for rhinovirus (common cold virus). Eight cases were positive for the presence of rhinovirus only. Two patients tested positive for the presence of adenovirus, and one tested positive for the presence of rhinovirus and adenovirus. Two patients tested positive for the presence of parainfluenza virus. Increases in virus detection in general practice coincided with peaks in consultation rates (see Figure 5.2).

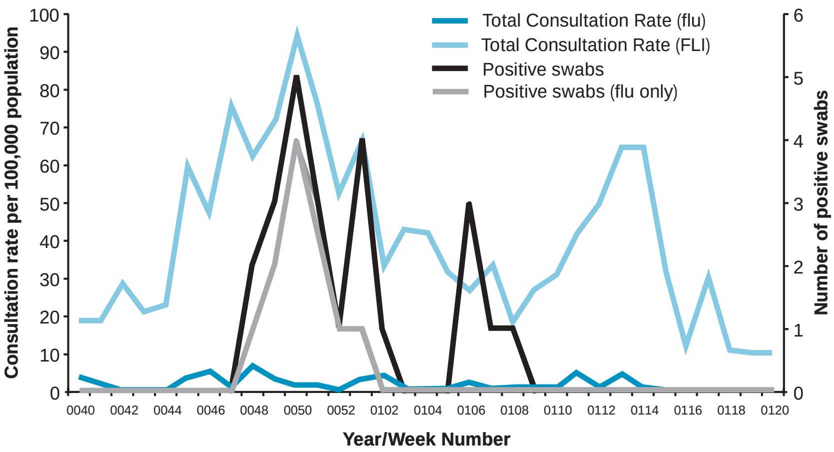
Routine laboratory testing

Between 2 October (week 40) 2000 and 20 May (week 20) 2001, a total of 173 samples were found positive for influenza through routine laboratory testing (see Figure 5.3).

Of the 173 samples, there were 5 reports of influenza B virus isolation from samples submitted in weeks 8 and 10. Influenza A virus was isolated from 2 samples submitted in weeks 8 and 9. No further typing details are available on these isolates. Influenza B virus antigens were detected in 3 samples submitted in weeks 6 and 7. One sample was PCR positive for influenza B.

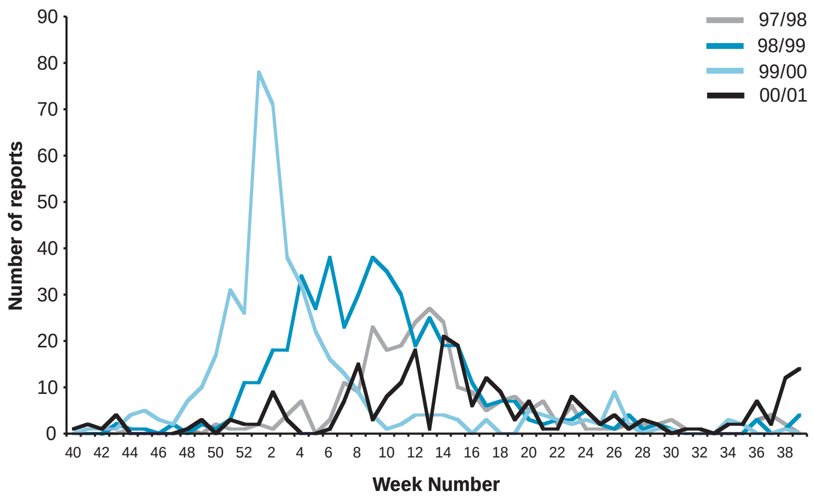
The remaining 162 laboratory reports related to blood samples submitted to

Figure 5.2 Consultation rates for flu and flu-like illness and enhanced virological surveillance results, 2000-2001, Northern Ireland



Source: CDSC (NI) Enhanced Surveillance of Influenza

Figure 5.3 Routine laboratory reports of influenza A and B by date of specimen, 2000-2001, Northern Ireland



Source: CDSC (NI) routine laboratory reports

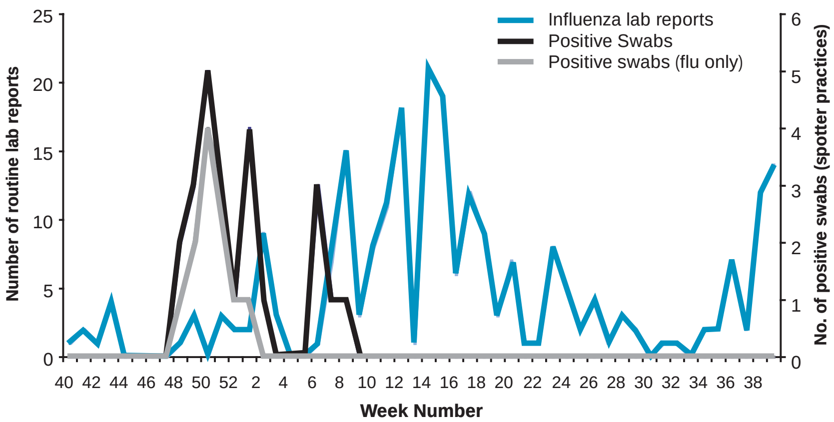
the Regional Virus Laboratory since week 40 (2000) for serological analysis. Thirty-six were positive for influenza A antibodies and 126 for influenza B antibodies. However, since serological titres to the virus may be due to previous infection or vaccination, they cannot be solely relied upon as an indicator of current infection.

As can be seen from Figure 5.3, the number of laboratory reports for influenza during the 2000-2001 season was much lower than any of the previous three seasons, but most closely followed the pattern of the 1997-1998 season. This was also the case for rates in the rest of the UK. The reduced level of influenza activity which was observed has therefore been reflected in the low numbers of influenza consultations observed in general practice.

When the results of routine laboratory testing are compared with the results from virological surveillance in the community, it can be seen that virus activity is detected a number of weeks earlier by the community-based surveillance (see Figure 5.4). The peak number of swabs positive for influenza virus occurred in week 51, whereas the first indication of increased activity was observed in week 02 of the routine laboratory testing scheme.

Variations and increases in consultation rates for FLI observed during winter 2000/2001 would appear to have been due to influenza and a number of other respiratory viruses. Consultation rates for FLI fluctuated much more and remained at higher levels than those observed for influenza. This reflects the fact that the "flu-like illness" category contains a number of clinical diagnoses other than influenza. Not only does this allow the measurement of other viruses which are causing morbidity in the community, but it would also appear to have captured genuine cases of influenza which may not have been classical at the time of presentation. It is also clear that both the consultation rates and virological surveillance in the community provide more timely indicators of virus activity than the routine laboratory results alone. In future seasons, it is hoped that community-based surveillance will be the basis of a time-critical warning

Figure 5.4 Routine laboratory reports of influenza and enhanced virological surveillance of influenza in general practice, 2000-2001, Northern Ireland



Positive swabs = positive by Polymerase Chain Reaction for any of the following: flu A H3N2, flu A H1N1, flu B, human rhinovirus, parainfluenza virus 3 or adenovirus
Positive swabs (flu only) = positive by Polymerase Chain Reaction for either flu A H1N1, flu A H3N2 or flu B

Source: CDSC (NI) Enhanced Surveillance of Influenza and routine laboratory reports

system, with routine laboratory testing playing a more retrospective role in providing detailed epidemiological and demographic information.

Influenza vaccination campaign, Winter 2000/2001, Northern Ireland

The influenza immunisation policy implemented by the DHSSPS for 2000/2001 stipulated that influenza immunisation should be offered to all those aged 65 years and over, those living in long-stay residential and nursing homes or other long-stay facilities, and those of all ages with any of the following conditions: chronic heart disease, chronic respiratory disease (including asthma), chronic renal disease, diabetes mellitus or immuno-suppression due to disease or treatment.

For the first time a regional and Board target of 65% was set for uptake of influenza vaccinations among people aged 65 years and over. The aim of the policy was to reduce serious illness and deaths from influenza. The targeted groups are those most likely to suffer complications or to die from influenza.

The Influenza Vaccination campaign commenced on 1 October 2000 and terminated on 31 January 2001 and the uptake of influenza vaccine was monitored throughout. At the end of the Influenza Vaccination campaign, General Practitioners provided CDSC (NI) with a standard summary form detailing the age and risk factor profile of patients who received influenza vaccine during the campaign, for regional collation and analysis. Vaccinations administered to patients outside the recommended risk groups were not included in the return.

Patients aged 0-14 years and 15-64 years were categorised with one of the above high-risk conditions or as living in long-stay residential or nursing care. Where a patient had more than one of the high-risk conditions the GP used his judgement to determine to which category they should be assigned. Vaccines administered to patients living in long-stay facilities were recorded in this category irrespective of whether the patient suffered from any high-risk disease. Risk factor information was not recorded for patients age 65 years and over.

There were 362 registered practices in Northern Ireland at 1 October 2000 and 358 returned the summary information to CDSC (NI); 99.6 % of the total registered population was covered by the practices which submitted a return. 221,848 influenza vaccines were administered to the target groups during the winter 2000/01. 155,303 (70% of the total) were administered to the 65+ age group. The uptake rate among the 65 years and over population in was 68% (Table 5.1).

Table 5.1: Influenza Vaccine Programme Summary, Winter 2000/01, Northern Ireland

	EHSSB	NHSSB	SHSSB	WHSSB	NI
No. of practices in Board (CSA Oct 00)	146	81	77	58	362
Size of registered population in Board (CSA Oct 00)	716794	414413	335331	303279	1769817
Size of registered 65+ population in Board (CSA Oct 00)	100801	54061	39800	32266	226928
% of registered Board population covered by practices which submitted return	99.39%	100%	99%	100%	99.57%
No. of vaccines administered from practices which submitted return					
Total number administered in Board	92322	55343	39062	35121	221848
Median	568	584	430	545	544
% vaccine uptake rate among 65+ population per practice submitting return					
Total no. of vaccines administered to 65+ population	67635	38130	26495	22770	155030
Range	39% - 89%	40% - 92%	41% - 94%	50% - 86%	39% - 94%
Median	68%	72%	67%	72%	70%
Mean uptake rate as percentage of 65+ population (CSA Oct 00) in Board	67%	71%	67%	71%	68%
Percentage of practices achieving >65% uptake rate	66%	77%	64%	86%	71%

Source: CDSC (NI)

The target uptake rate of 65% was reached by the end of November and, by the end of the campaign, had been exceeded in each of the four Health and Social Services Boards (range 67%-71%). 4,293 vaccines were administered to patients under 15 years, 87% of which were given to children with chronic respiratory disease. Of the 61,842 patients within the 15-64 years age group who were vaccinated, 44% were categorised as having chronic respiratory disease, 27% from chronic heart disease and 18% from diabetes (Table 5.2).

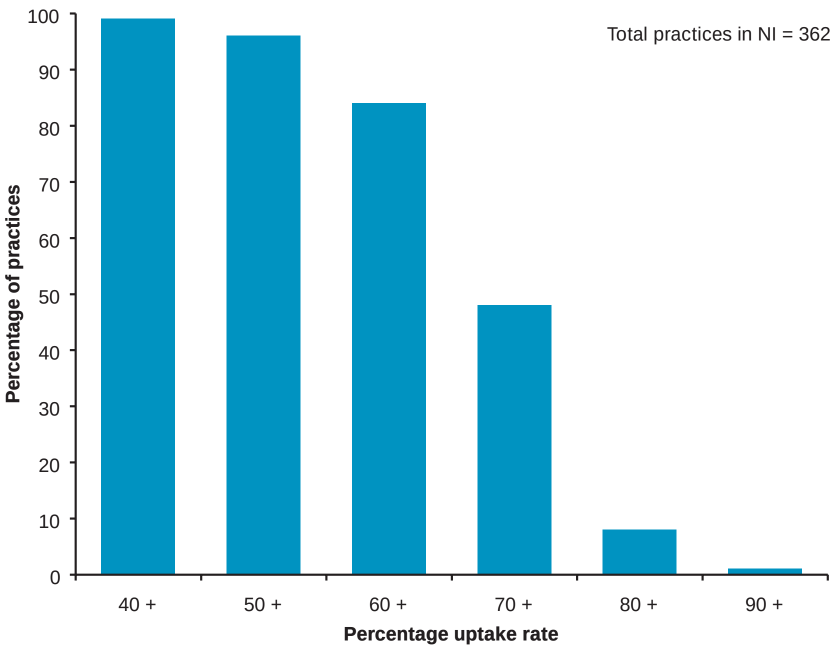
71% of practices ultimately met or exceeded the 65% target uptake rate in the over 65 years age group. England and Scotland achieved 65% and 64% vaccination uptake amongst the 65+ population respectively during the 2000/2001 campaign. A target of 70% uptake among the 65+ population has been set for 2001/2002; the evidence from the 2000/2001 campaign suggests that this should be achievable as 48% of practices in Northern Ireland achieved an uptake of at least 70% during 2000/2001 (Figure 5.5).

Table 5.2: Influenza vaccines administered, by age and clinical risk profile, Winter 2000/01, Northern Ireland

Age		Chronic respiratory disease	Chronic heart disease	Chronic renal disease	Diabetes	Immuno-suppression	Residential/ nursing homes	Total
0-14		4 293	115	36	291	87	86	4 913
15-64		27 371	16 681	1 066	10 901	3 773	2 050	61 842
65+	155 030							155 030
Total	**155 030**	**31 664**	**16 796**	**1 102**	**11 192**	**3 860**	**2 199**	**221 848**

Source: CDSC (NI)

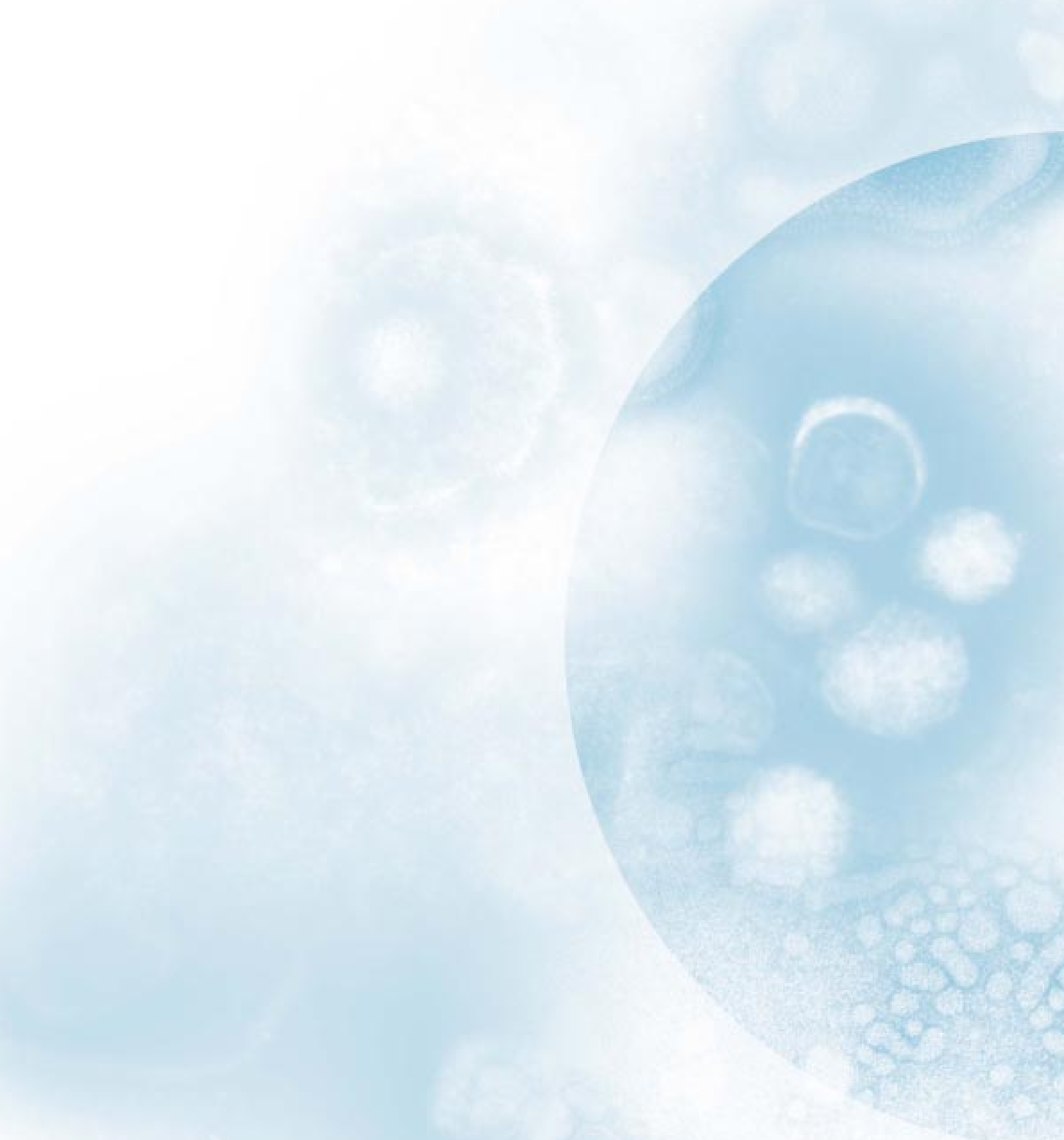
Figure 5.5: Percentage influenza immunisation uptake rate in 65+ age group, by GP practice, Winter 2000/2001, Northern Ireland



Source: CDSC (NI)

Chapter 6

Antimicrobial Resistance



Antimicrobial Resistance

Antimicrobial agents have been used successfully for more than 50 years to control and treat infections. Infections which, two generations ago, were potentially life-threatening, can now be effectively treated. Antimicrobial agents include antibiotics (substances produced by micro-organisms that kill or inhibit other micro-organisms), chemically produced antibacterial drugs and other anti-viral and anti-fungal agents. Antimicrobials agents have also been an essential component of new medical and surgical treatments. For example, many cancer treatments render a patient susceptible to infection and prompt administration of antimicrobial drugs will often eradicate infection in these very vulnerable patients.

Antibiotics are used extensively and, apart from simple painkillers, no other drugs are in such widespread use. In the UK, approximately 50% of antibiotic usage is in man and the remainder is used in veterinary medicine or for growth promotion in animals. Most antibiotic prescribing in the UK (80%) is for oral antibiotics in the community. It is estimated that 50 million antibiotic prescriptions are dispensed annually in England. This is equivalent to an average of one antibiotic prescription per person per year. Approximately half of these oral antibiotics are prescribed for respiratory tract infections[1].

Resistance to antimicrobial agents is a natural evolutionary process and reflects the response of microbes to antimicrobial exposure. Antibacterial agents kill susceptible bacteria, but resistant organisms survive and can transfer resistance to other organisms which may have been originally sensitive or susceptible to that particular antimicrobial agent. This process allows resistant organisms to accumulate and spread. Infection with these resistant organisms increases clinical complications and necessitates a longer stay in hospital. It often means that more potent, and sometimes toxic, antimicrobial drugs are required. The net result is that antimicrobial resistance is associated with increased morbidity, mortality and increased financial cost to the health service.

The mass production of penicillin commenced in the early 1940s. New classes of antimicrobial agents were developed over the next 20 - 30 years. However, since the 1980s no new classes of antimicrobial agents have been developed, and the only developments have been improvements within various classes of antimicrobial agent. Over this time there has been a relentless growth in antimicrobial resistance. There is now international political and medical concern regarding the rise in antimicrobial resistance[1-4]. In the UK there have been several major reports outlining the extent of the problem and the measures which will be developed to ensure that antimicrobials agents are used appropriately. This includes public and professional education to avoid unnecessary and inappropriate antimicrobial use particularly for simple coughs, colds and viral sore throats.

Methicillin resistant *Staphylococcus aureus* (MRSA)

Staphylococcal aureus is an organism which causes a variety of infections ranging from various types of skin infection (abscesses, impetigo, infected cuts/wounds) to life threatening septicaemia. Approximately 30% of the population are colonised by this organism, that is, the organism is found harmlessly on their skin particularly in the groin, nose and axillae. In the absence of debilitating illness or breaks in the skin, such as following surgery, it remains harmless. However, patients with serious underlying disease or who have had surgical instrumentation or have had catheters or intravascular cannulae inserted, are at an increased of infection. *S. aureus* can also survive for long periods on hands, beds, hospital/ medical equipment and the general hospital environment. Hands are probably the most important means of spread of *S. aureus.* Therefore, good handwashing practice by patients and staff is essential to prevent spread of infection.

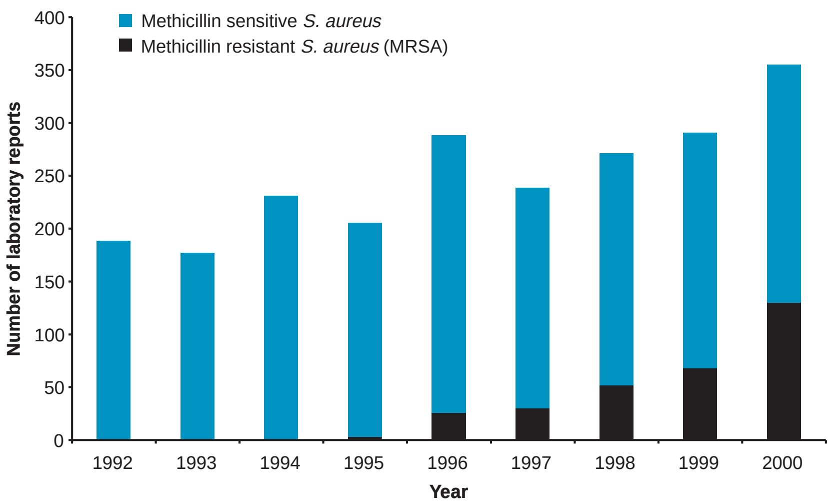
When penicillin was first introduced over 95% of *S. aureus* isolates were susceptible, but now only 10% are susceptible. In the 1950s, approximately ten years after the introduction of penicillin, increasing resistance to penicillin was noted in hospitals. New antibiotics, such as methicillin which was introduced in the 1960's, were initially successful in combating these resistant strains. However, it was only a question of time before methicillin resistant strains of *S. aureus* (MRSA) were noted.

MRSA infections are now a major problem in hospitals in the UK and abroad. In hospitals there are large numbers of patients undergoing various invasive treatments and, at any one time many patients are receiving antibiotics. Both these factors contribute to the development and spread of MRSA.

MRSA acts in exactly the same way as *S. aureus* and causes the same range of infections. Many individuals will carry MRSA on their skin or in their nose. What makes MRSA different is its resistance to antibiotics. Some antibiotics remain effective but they are more difficult to use and may, for example, have to be administered intravenously and can cause side effects. As with *S. aureus* infections good handwashing practice and high standards of environmental cleanliness are essential control of infection measures for preventing spread of MRSA.

The number of laboratory reports of *S. aureus* isolated from blood or cerebrospinal (CSF) fluid received by CDSC (NI) has increased progressively since 1997 (Fig 6.1). There has been a 49% increase in reports between 1997-2000. The number and proportion of *S. aureus* isolates that are methicillin resistant have also risen steadily since 1995. In 2000, of the 355 laboratory reports of *S. aureus* isolated from blood or CSF, 130 (37%) were MRSA. This is similar to England and Wales, where 34% of *S. aureus* bacteraemia and CSF reports were methicillin resistant during 2000 (CDSC Colindale).

Figure 6.1: Laboratory reports of *Staphylococcus aureus* (blood and CSF), 1992-2000, Northern Ireland



Source: CDSC (NI)

MRSA survey

In 1999, the Northern Ireland MRSA Working Party in 1999 noted the apparent increase in MRSA isolates from clinical laboratories in Northern Ireland. Many of these isolates were from skin swabs. Some swabs were taken from wounds or sites of obvious infection. Others were taken from patients who were asymptomatic but were perceived as being of high risk of carrying MRSA because of their previous medical history. It was already known that differing policies existed within local hospitals regarding screening patients for the presence of MRSA and this would have a marked influence on detection of MRSA, particularly in those patients colonised with MRSA. It was therefore decided to pilot an enhanced MRSA surveillance programme with the aim of describing the epidemiology of MRSA in Northern Ireland.

Methodology

All microbiologists and clinical laboratories were invited to participate. A questionnaire was completed for each new patient from whom MRSA was isolated between 1 October 1999 and 31 May 2000. This questionnaire sought details on patient characteristics, whether infected or colonised, antibiotic treatment and perceived source of infection.

Microbiologists were provided with reporting guidelines to ensure standardisation of reporting and data collection. Definitions of colonisation and infection were the same as those used in the US National Nosocomial Infections Surveillance Manual. For the period of the pilot, microbiologists agreed to forward all MRSA isolates to the Staphylococcal Reference Laboratory in London for typing and more detailed analysis.

Results

There were 1004 isolates of MRSA reported from 1 October 1999 to 31 May 2000; 526 (52%) were male and 476 (47%) were female (gender information was missing in 2 cases). Six hundred and seventy (67%) isolates were from hospitalised patients during the survey period, and 308 (31%) were community patients.

Table 6.1: Age in years by patient status

	Hospitalised Patients		Community Patients	
	Colonised	Infected	Colonised	Infected
Mean	71	68	69	73
Median	76	74	75	80
Minimum	0	0	0	0
Maximum	100	94	103	98

Source: CDSC (NI)

Prior to the study, there was a perception that MRSA was being introduced into Northern Ireland from other countries. However, where the area of residence was known, 99% of isolates were from individuals resident in Northern Ireland.

Generally, those with MRSA were elderly with the median and mean ages greater than 65 years. This reflects the ages of those in hospital and in residential/ nursing care (Table 6.1). The ages ranged from under one year to 103 years.

Infection Control Teams were asked to indicate the likely source of MRSA acquisition. Of the 848 patients for which this information was available, 218 (26%) were thought to have acquired MRSA in hospital, 154 (18%) were thought to have acquired it in the community and in 476 (56%) cases the source of MRSA could not be reliably determined.

Hospitalised patients

MRSA was reported in 670 hospitalised patients of whom 433 (65%) had been admitted from their own residence, 121 (18%) had been admitted from another hospital and 100 (15%) from nursing/ residential care homes. The majority (74%) of patients were colonised and 167 (26%) were infected. Two hundred and eight (31%) of the hospitalised patients were thought to have acquired MRSA in hospital.

Skin and soft tissue was the most common major site of infection (41%). Other common major sites of infection were the genito-urinary system (18%), surgical sites (16%), and lower respiratory tract (16%). Information regarding administration of antibiotics vancomycin and teicoplanin was available for 127 of the 167 infected hospitalised patients and, of these 127 patients, 49 (39%) received these particular antibiotics to treat their infection.

Patient outcome was recorded for 564 of the 670 hospital patients. One hundred and thirty six patients died and the relationship of MRSA infection to death was recorded for 107 (79%) patients. There were only three patients in whom it was considered MRSA infection contributed to death. Forty-seven percent of hospitalised patients were discharged home, 17% were discharged to nursing/residential care and 12% were transferred to another hospital.

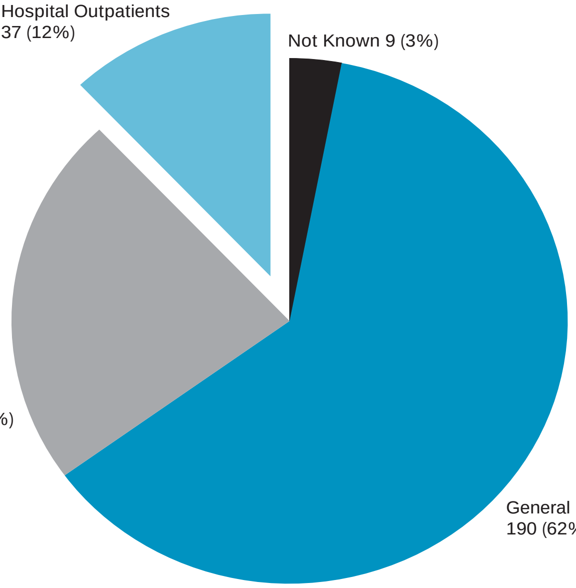
Community patients

Nearly two thirds (62%) of 308 MRSA reports in the community were from specimens submitted from general practices, with the others originating from residential/nursing care homes and hospital outpatients (Fig 6.2)

Information on colonisation/infection was recorded on 197 patients; 121 (61%) were colonised and 76 (39%) were infected. However, it was noted that 52% of the 56 patients in nursing/ residential care homes with MRSA had evidence of infection, although patient status information was not available for 16 patients.

Source of MRSA was recorded for 237 (77%) of the community cases. The source of MRSA was thought to be community acquired in 117 (49%) patients and hospital acquired in 10 (4%) patients. For 110 (46%) patients the source was recorded as undetermined.

Figure 6.2: Community patients with MRSA: Source of specimen



Source: CDSC (NI)

Phage types

Local laboratories submitted 732 (73%) of the 1004 MRSA isolates to the reference laboratory for further identification. Three phage types accounted for 73% of the MRSA isolates which were typable: 222 (36%) were identified as phage type Irish-2, 153 (25%) as phage type Irish-1 and 77 (12%) as phage type EMRSA-15.

This short survey has confirmed that MRSA has been detected in a variety of clinical settings throughout Northern Ireland. The majority of patients with MRSA are colonised rather than infected with this bacteria, although such individuals are capable of passing the organism onto others. As MRSA is carried on skin, it is not surprising that skin and soft tissues are the main sites for infection. It can be difficult to state the likely source of MRSA in any given patient. Some acquire MRSA while in hospital but others acquire it in the community.

The results of this survey highlight the continued need for using antibiotics only when clinically required, using the appropriate dose and duration of treatment. This has implications for both public and professional education. These approaches also require to be combined with effective control of infection measures, particularly thorough handwashing by staff after delivering care to each patient, and the further development of surveillance to monitor changes in antimicrobial resistance. As an example of good practice and education of health care professionals, guidelines have been prepared for staff in residential and nursing homes for the management of residents with MRSA[5]. In addition, preparations are being made to develop a comprehensive approach to combating antimicrobial resistance in Northern Ireland.

References

1. Standing Medical Advisory Committee (1998). The Path of Least Resistance. London, Department of Health.

2. House of Lords Select Committee on Science and Technology (1998). Resistance to Antibiotics and other Anti-microbial Agents. London, HMSO.

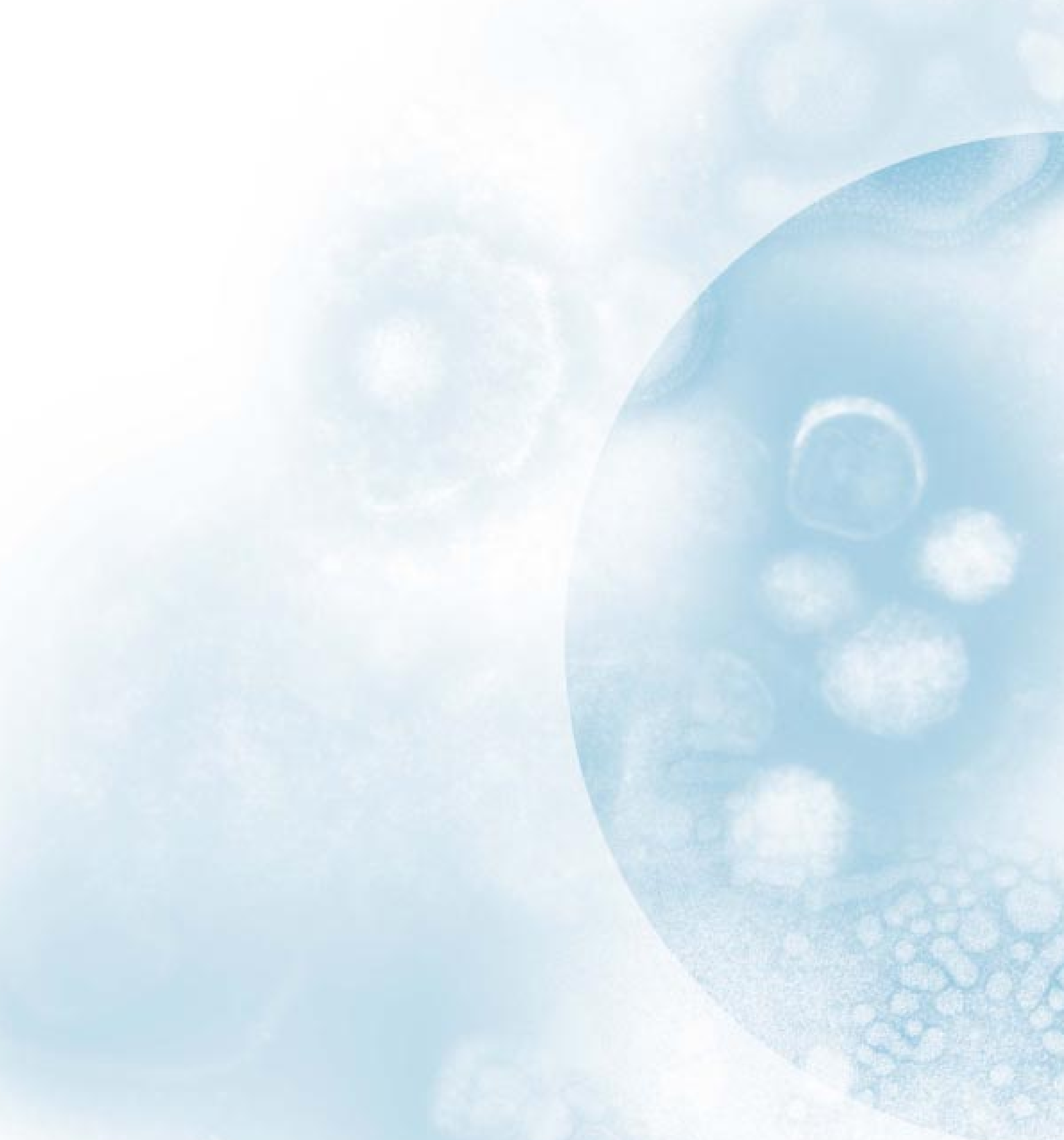
3. Department of Health (2000). UK Antimicrobial Resistance Strategy and Action Plan. London, Department of Health.

4. National Disease Surveillance Centre (2001). A Strategy for the Control of Antimicrobial Resistance In Ireland – Report of the Subgroup of the Scientific Advisory Committee of the National Disease Surveillance Centre. Dublin, National Disease Surveillance Centre.

5. Department of Health and Social Services MRSA Working Party (1997). Guidelines for Residential and Nursing Home Staff for Management of Residents with MRSA. Belfast, Department of Health and Social Services.

Chapter 7

Vaccination and Immunisation



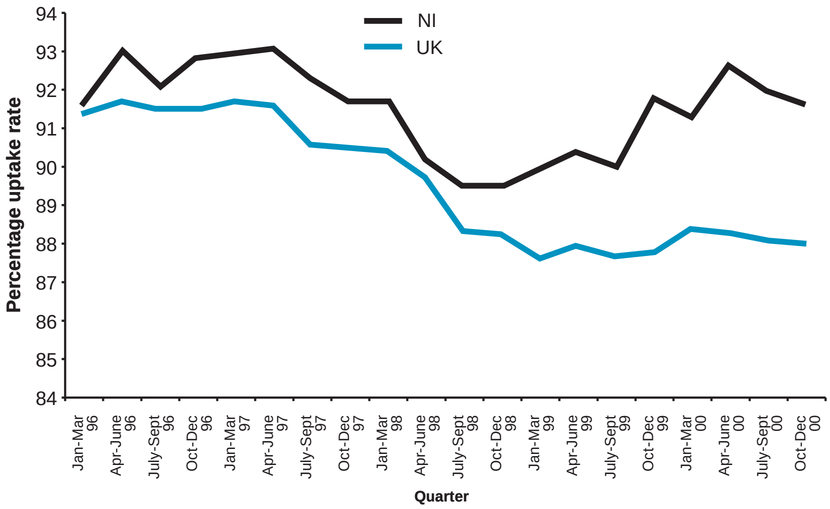
Vaccination and Immunisation

The children's immunisation programme, particularly the measles mumps rubella (MMR) vaccine, was rarely out of the news during 2000. Expert independent scientific committees, both in the UK[1-2] and abroad, including the World Health Organisation, stated the MMR vaccine to be both safe and effective. Despite this there were a series of media reports, often based on research with methodological limitations, casting doubt on the safety profile of MMR vaccine and speculating on possible links to autism and chronic bowel disease[3].

Not surprisingly, these allegations have been associated with a fall in the percentage of children receiving MMR vaccine by their second birthday (Fig 7.1). In Northern Ireland, MMR vaccination uptake rates fell from 93% in mid 1997 to a low of 89.5% in 1998. Uptake rates then increased to 92.7% during April-June 2000 before falling over the two subsequent quarters to 91.6%.

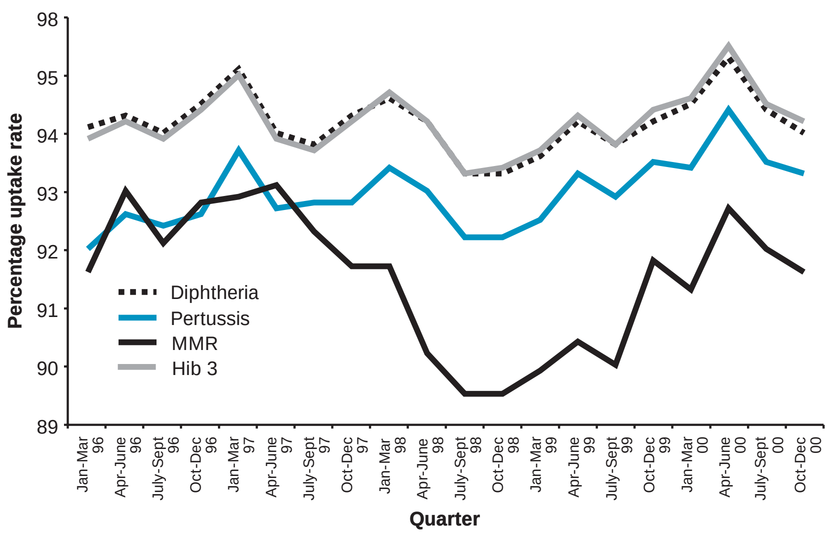
Nevertheless, MMR vaccination uptake rates in Northern Ireland compare very favourably with the UK as a whole, where the average uptake among children by their second birthday averages 88%. Unlike Northern Ireland where uptake rates began to increase from mid 1998, uptake rates in the UK have remained relatively constant at 88%.

Figure 7.1: MMR vaccination uptake rate at 24 months of age by quarter, 1996 – 2000, Northern Ireland and UK



Source: COVER/Korner - CDSC (Colindale)

Figure 7.2: Vaccination uptake rates by quarter, 1996 – 2000, Northern Ireland (Diphtheria, pertussis and Hib at 12 months, MMR at 24 months)

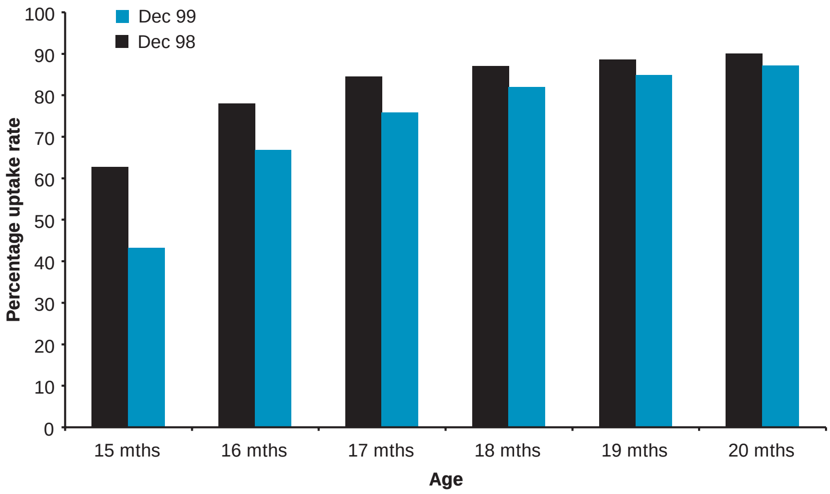


Source: COVER/Korner - CDSC (Colindale)

Uptake rates in Northern Ireland of the other childhood vaccines against polio, diphtheria, tetanus, pertussis (whooping cough) and haemophilus influenza type b (Hib) have been relatively little affected by the controversy surrounding MMR vaccine. During 2000, uptake rates among children by their first birthday ranged from 93-96%. In general, uptake rates for whooping cough vaccine were one percentage point lower than for other vaccines (Fig 7.2). This demonstrates that some parents were being selective as to which vaccines should be administered to their child.

MMR vaccination is normally offered to children in Northern Ireland when they are 15 months old and MMR vaccination uptake is calculated when children reach their second birthday. Thus children born between October and December 1998 are called for vaccination between January and March 2000. The vaccination uptake rate is based on their vaccination status at their second birthday during the period October to December 2000. The Northern Ireland uptake rates for this cohort are available approximately six weeks later, in mid February 2001. Using this methodology means that if parents, as a result of media concerns or some other adverse vaccine issue, decline the offer for their child to receive MMR vaccine, it could be nearly 12 months before this will be reflected in the routine vaccination uptake statistics.

Figure 7.3: Enhanced MMR vaccine surveillance: birth cohort December 1998 vs December 1999, Northern Ireland



Source: CDSC (NI)

In order to better track the influence of media coverage and the impact of the public and professional educational initiatives, enhanced monitoring of MMR vaccine uptake commenced in early 2001. This involves monitoring the MMR vaccination status in a cohort of children in each Board at monthly intervals and comparing it with a similar cohort born twelve months earlier. The initial results are presented in Fig 7.3. When comparing the December 1998 birth cohort with that born in December 1999, there was a difference of 20 percentage points at 15 months in MMR vaccine coverage but this narrowed to three percentage points by 20 months. This suggests that some parents may delay MMR vaccination but do, subsequently, have their children immunised.

While the MMR uptake statistics for Northern Ireland during 2000 averaged 91-92%, the quarterly uptake rates within Boards varied from 88-94%. There will be areas within Boards where the uptake rate is higher than average and, similarly, there will be geographical areas or social groupings where vaccine uptake rate will be less than others. The Child Health System can calculate the vaccine uptake by geographical area, clinic or health centre and by general practitioner and health visitor. This enables the CCDC to quickly identify areas where uptake is considerably less than average, and with local health care professionals, investigate any local reasons for this decline and develop an appropriate action plan. It is hoped that enhanced surveillance will contribute to this process by providing valuable early information on MMR vaccine uptake trends.

In response to concern about the publicity associated with MMR vaccine, CCDCs have undertaken a series of seminars for general practitioners, other primary care staff and community nurses. The Health Promotion Agency for Northern Ireland has revised and updated existing information for parents and health professionals. This includes a leaflet which can be mailed by the Child Health System as the child's vaccination date approaches. Included in the pack for health professionals is a resource produced by North Wales Health Authority '*The MMR Story, Mythbuster*'. This material is designed for use during a consultation with a parent asking searching questions about MMR.

Mumps outbreak

Mumps became a notifiable disease from October 1988 to facilitate monitoring the impact of the MMR vaccine introduced in 1988. Following the introduction of MMR vaccine, notifications of mumps in Northern Ireland progressively declined until 1996-7 and then began to rise. In 2000 there were 1006 notifications of mumps, compared to 68 in 1997 (Fig 7.4).

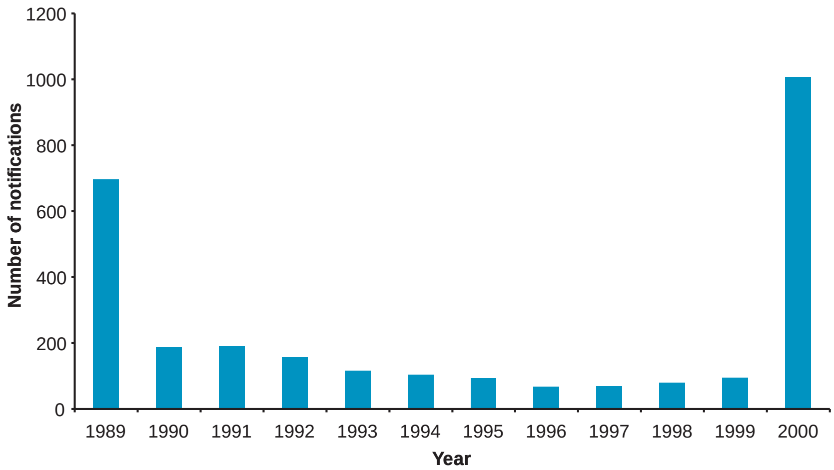
In November 1999 an outbreak of mumps started in the mid-Ulster area. The initial cases were in the Carrickmore area close to the boundary of the Northern, Southern and Western Health and Social Services Boards. The outbreak then radiated out to neighbouring areas in these three Boards before extending to Derry in September 2000[4]. To date, the outbreak has not spread to the Eastern Board area. A total of 1541 notifications of mumps have been received in Northern Ireland between week 41 in 1999 and week 36 in 2001 of which 1465 (95%) were from residents of the Northern, Southern and Western Boards. (Figure 7.5)

Since 1995 CCDCs, upon receipt of a notification of measles, mumps or rubella infection, arrange salivary antibody testing to be undertaken through the notifying clinician. A confirmed case of mumps is defined as one with a positive IgM on salivary antibody testing. Since week 41 in 1999 there have been 529 confirmed cases of mumps in Northern Ireland.

There were 332 confirmed cases notified between November 1999 and August 2000; of these 316 (just over 95%) were in the 9-19 age group, with a median age of 14 years. Initial analysis of the 316 cases noted that 129 (41%) had never received MMR vaccine, 184 (58%) had one dose of MMR, and only 3 (1%) received 2 doses of MMR.

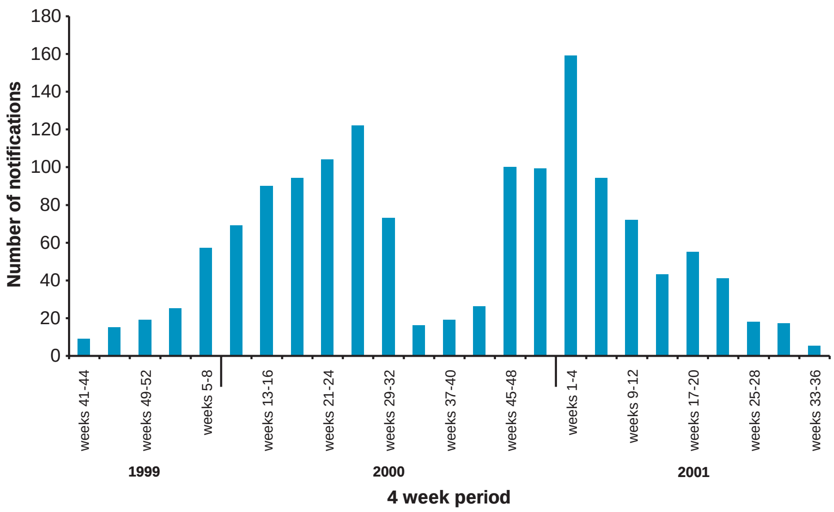
Transmission of infection was thought to mainly occur in schools, particularly secondary schools. It was noted that notifications started to decline during the July/August 2000 school holidays. Notifications then sharply increased during the autumn term particularly from week 45.

Figure 7.4: Annual notifications of mumps, 1989 – 2000, Northern Ireland



Source: CDSC (NI)

Fig 7.5: Mumps notifications by 4 week period, week 41 1999 – week 36 2001, Northern Ireland



Source: CDSC (NI)

MMR vaccination uptake rates in Northern Ireland in children by their second birthday since 1990 have ranged from 90-95%. Following the national measles rubella (MR) immunisation campaign in 1994 of all those aged 5-16 years, a second dose of MMR vaccine has been offered to those in the pre school age group (3-5 years). Currently 87% of children in Northern Ireland reaching their fifth birthday will have received two doses of MMR vaccine. Thus the majority of those at primary school (5-11 year olds) will have received two doses of MMR vaccine unlike those at secondary school.

This outbreak, which is one of the largest reported outbreaks of mumps, is further confirmation of the need for a two-dose MMR strategy. The high uptake of MR vaccine in 1994 has protected the secondary school population from measles and rubella infection but there remains a cohort who has received either no or only one dose of MMR vaccine. As a consequence of this outbreak arrangements are being made to ensure that all those leaving secondary school will have been offered, at some stage, two measles-containing vaccines one of which should be MMR. It is also noteworthy that the measles outbreak during 2000 in north County Dublin associated with 1595 cases did not spread to Northern Ireland despite considerable cross border population movement[5-6]. This reflects the current high level of vaccine induced immunity in the school population against measles. However, if uptake of MMR vaccine in Northern Ireland falls to levels currently noted in England (84%) and uptake rates remain at these low levels then there is a high probability that measles outbreaks will return. It is necessary to achieve a population vaccine coverage of 95% to be confident of preventing a resurgence of measles.

References

1. Medical Research Council (2001). Review of Autism Research. Available at http://www.mrc.ac.uk

2. CSM/MCA. MMR Vaccine: The Facts. **Current Problems in Pharmacovigilance**, 2001, 27:1-3. Available at http://www.mrc.ac.uk/.

3. Wakefield AJ, Murch SH, Antony A et al. Ilieal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children. **Lancet** 1998; 351: 637

4. Reaney EA et al, mumps outbreak among young people in Northern Ireland. **Communicable Disease and Public Health**, 2001;4 (4):311-315.

5. Cronin M, Measles Outbreak Dublin 2000. **Epi-Insight**, 2000, 1 (2) 2-3. Available at http://www.ndsc.i.e./Publications/Epi-Insight/.

6. Cronin M and O'Connell T. Measles Outbreak in the Republic of Ireland. **Eurosurveillance Weekly**, 2000, 4 000210. Available at http://www.eurosurv,org/2000/000210.html.

Chapter 8

Sexually Transmitted Infections

Sexually Transmitted Infections

Sexually transmitted infections (STIs) are a rising threat to the public's health. Often asymptomatic, and therefore undiagnosed, they can result in pelvic inflammatory disease, and later complications such as infertility, ectopic pregnancy and genital cancers. STIs which cause genital ulceration can also enhance transmission of HIV. Many of these complications particularly affect young women. The consequences of infection relate not just to that individual but also to their partner(s) who may also require investigation and treatment. In view of the increasing incidence of these infections, especially among young adults, interventions to promote sexual health have enormous potential for health gain. Promotion of sexual health must be a priority for all concerned with the public's health.

Although sexual behaviour changed in the UK in response to the HIV/AIDS epidemic, safer sexual practices have not been sustained[1]. This is illustrated by:

- the general increase in new sexually transmitted infections being diagnosed at Genito-Urinary Medicine (GUM) clinics
- the recent outbreaks of syphilis
- the increase in diagnosis of sexually transmitted infections in men who have sex with men, in particular gonorrhoea and syphilis
- the specific increase in gonorrhoea in the heterosexual population
- the increase in diagnoses in teenagers and young adults under 25 years

Data sources

The most comprehensive source of data on STI in Northern Ireland is provided by the four GUM clinics in Belfast, Coleraine, Derry and Newry. Sexually transmitted diseases are not included in the list of notifiable diseases, and therefore we are heavily reliant on these statutory returns from GUM clinics.

Data is recorded on gender and male sexual orientation for some diagnoses only, and for specific infections, data is also collected on age groups. Area of residence is not recorded. More than 80% of all those who attended GUM clinics in 2000/2001 in Northern Ireland were seen at the GUM clinic at the Royal Group of Hospitals, so it is not possible to draw any conclusions about geographical patterns of disease incidence within Northern Ireland on the basis of clinic attendance.

In relation to AIDS and HIV, there is an enhanced UK surveillance system based on voluntary, confidential reports by clinicians, which is more comprehensive.

Determinants of sexual health

There are a number of factors underlying the increase in diagnosis of sexually transmitted infections. Greater awareness of sexually transmitted infections, both public and professional, greater acceptability and accessibility of GUM services and improved diagnostic methods have all contributed to the rise.

However, the significant increases in gonorrhoea and syphilis are considered most likely to reflect increased transmission[2], not withstanding the influence of other factors. The figures indicate that the risk of acquiring sexually transmitted infections is highest amongst young people. The reasons for this are complex and reflect the interaction of biology and behaviour, complicated by disadvantage and difficulty accessing services and information.

Sexual behaviour influences risk. Young age at first intercourse, number of lifetime sexual partners, frequency of partner change, concurrent partners and unsafe sex all determine transmission of infection[2].

Comprehensive data on the sexual activity of young people in Northern Ireland, and their attitudes to protecting themselves from the possible consequences, was compiled by the Health Promotion Agency, following a survey conducted in1997/1998[3]. The Health Behaviour in School-Aged Children survey showed that, in a sample of 3,450 young people aged between 13-16 years, 665 (14.9%) respondents reported that, at the time of the survey, they had experienced sexual intercourse. The average age of first sexual intercourse for boys was 13 and for girls was 14.

Of interest, almost 80% of those who had experienced sexual intercourse reported using some form of contraception, with condoms being the most popular choice (81% of those who used contraception).

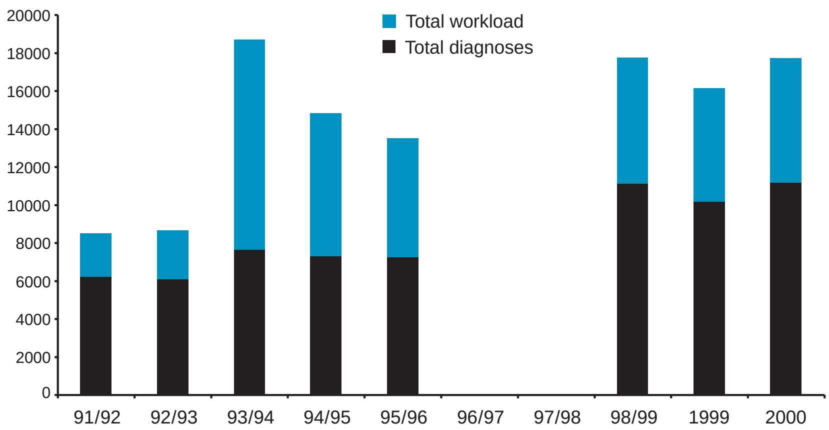
Early initiation of sexual activity is generally associated with disadvantage, both socio-economic and educational. Young people who have sex early are more likely to report high numbers of sexual partners, being diagnosed with a STI and becoming pregnant.

Diagnostic trends: historical and recent

Between the mid-1980s and the early 1990s, following on the emergence of HIV/AIDS, there was a downward trend, or stabilisation, in the incidence of other sexually transmitted infections in the UK [1,2]. This trend was probably due to the change in sexual behaviour brought about by extensive public awareness raising about AIDS. In England, Scotland and Wales, the decline was most obvious in syphilis and gonorrhoea incidence, but the incidence of genital herpes and warts also remained stable throughout the decade.

However, in the last decade, this trend has reversed. The number of new episodes at GUM clinics has doubled in Northern Ireland, reaching almost 18,000 in 2000/2001 (Figure 8.1a). The number of new STIs diagnosed has risen from an annual total of 6,000 in 1991/92 to over 11,000 in 2000/01. The increase appears to have been more pronounced in the latter half of the decade.

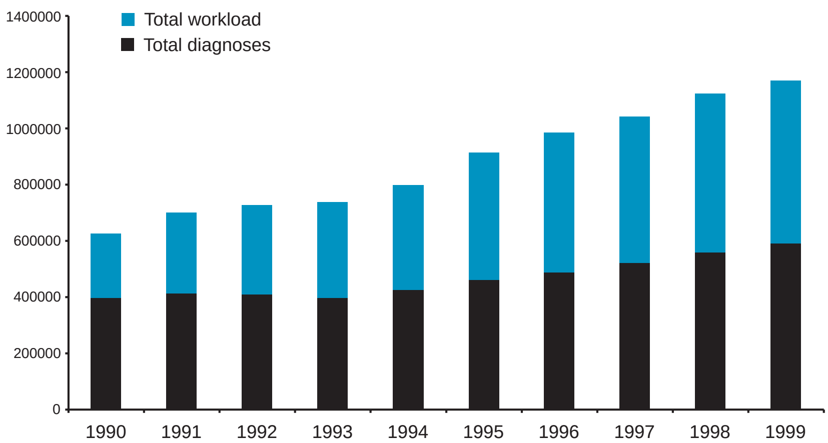
Figure 8.1a Total new episodes (diagnoses and workload) in GUM clinics: 1991-2000*, Northern Ireland



* Data for 2000 and 1999 is presented as calendar year; all other data is for fiscal year; data for 1996/7 and 1997/8 not available

Source: DHSSPS

Figure 8.1b Total new episodes (diagnoses and workload) in GUM clinics: 1990-1999, UK



Source: PHLS, DHSSPS, Scottish ISD(D)S Collaborative Group

Apart from new diagnoses, the figures show an even more marked increase in the workload associated with the provision of other sexual health services, such as HIV testing, counselling and the provision of advice. There has been a three fold increase in the provision of these services in the last decade, reflecting the greater awareness of the need for an holistic approach to the provision of sexual health services.

Figure 8.2 All new episodes (diagnoses and workload) in GUM clinics by gender: 2000, Northern Ireland

Fig 8.2a: male

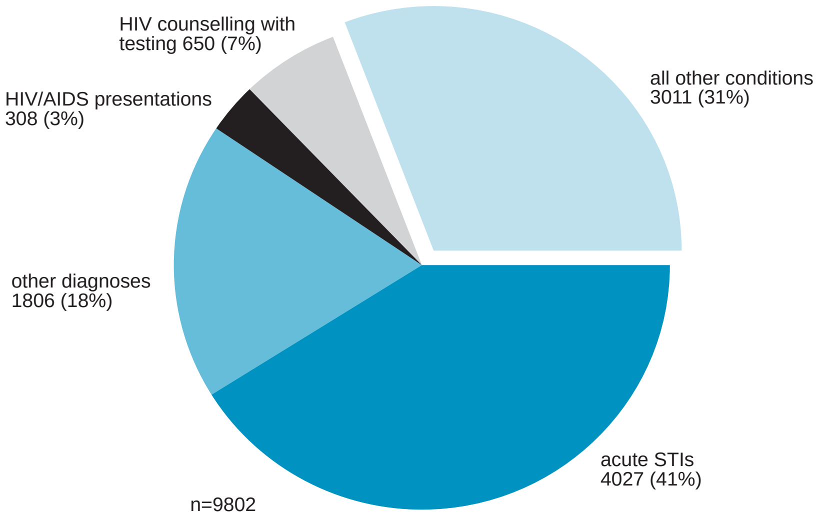
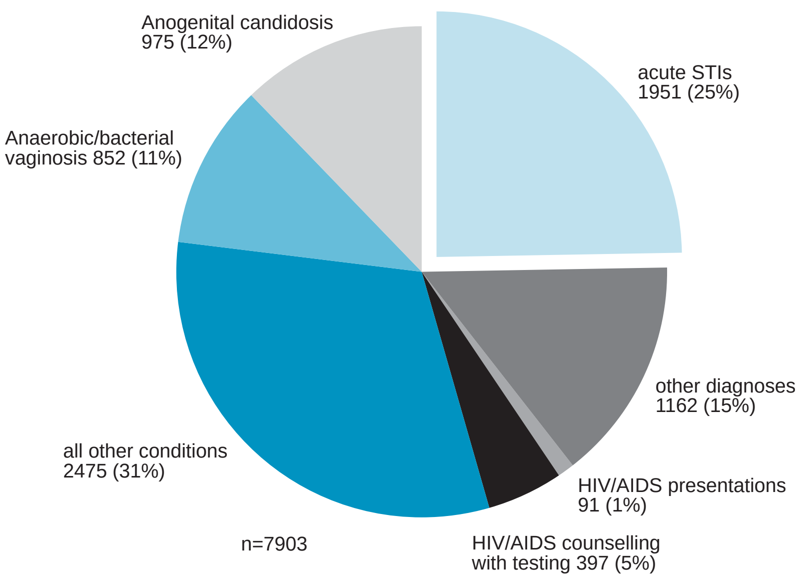


Fig 8.2b: female



Source: DHSSPS

This mirrors the pattern in the UK generally, where there were almost 1.2 million episodes in 1999 alone (Figure 8.1b). This includes only those diagnoses made at GUM clinics and excludes those made elsewhere within the health services. It represents a considerable underestimate of the actual burden of sexually transmitted infection in the wider community.

Sexually transmitted infections

Syphilis

In Northern Ireland, the most important issue in STI surveillance is the recent detection of an outbreak of syphilis which commenced in mid 2001. This outbreak mainly affects men who have sex with men (MSM). The initial cases had sexual contacts in Dublin, where a syphilis outbreak is ongoing and with which this outbreak has many features in common. This outbreak will be described in more detail in the 2001 report.

There have been five outbreaks of syphilis in the UK in the last 3 years [1,2]. In contrast to other STIs, rates of syphilis remained low throughout the UK during the 1990s. More than half of all infections in males were typically acquired abroad. Then, between 1998 and 1999, diagnoses of primary, secondary and early latent syphilis rose by 58% amongst males and 27% amongst females. In particular, the number of infections diagnosed amongst men who have sex with men (MSM) more than doubled.

A system of enhanced surveillance has been introduced in Northern Ireland and interventions designed to raise public and professional awareness have been undertaken. Awareness raising has been particularly targeted at MSM, with distribution of information and condoms at social venues.

The syphilis outbreaks in recent years have not been confined to men who have sex with men, but, of all STIs in this population, syphilis has shown the greatest increase. It suggests that the behaviour change (safer sex practices) which occurred, particularly amongst homosexual and bisexual males, as a result of the HIV epidemic may no longer predominate.

Genital chlamydial infection (uncomplicated)

Uncomplicated genital chlamydial infection is the most common bacterial STI diagnosed in Northern Ireland. The number of cases annually has doubled since 1995/96 (965 diagnoses in 2000). Still, in 1999, Northern Ireland had the lowest incidence rate in the UK in both males and females.

The incidence rate is highest in 20-24 year old males and females, and the most significant increases have also been seen in these groups (Figure 8.3). In this respect we differ from the UK as a whole, where the highest rate in females is in the younger 16-19 year old age group.

In Northern Ireland in 2000/01, 45% of women and 65% of men were under 25 years at diagnosis.

There is greater public and professional awareness about chlamydial infection, which is so often asymptomatic in women, and its potential impact on fertility, so this may also contribute to the upward trend in numbers diagnosed. However, it is likely that those diagnosed represent only the tip of the iceberg as many infections in women are asymptomatic.

Figure 8.3 Rate* of diagnosis of uncomplicated chlamydial infection at GUM clinics by gender and age group: 1991-2001, Northern Ireland

Fig 8.3a: male

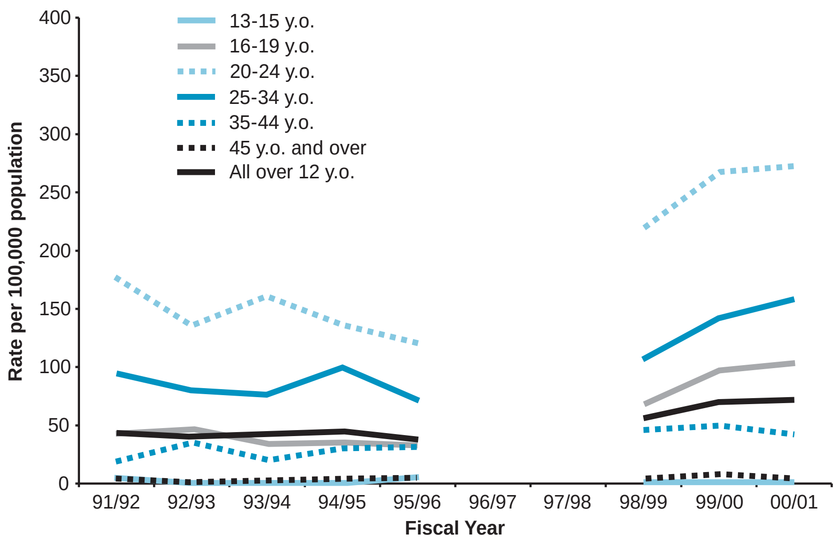
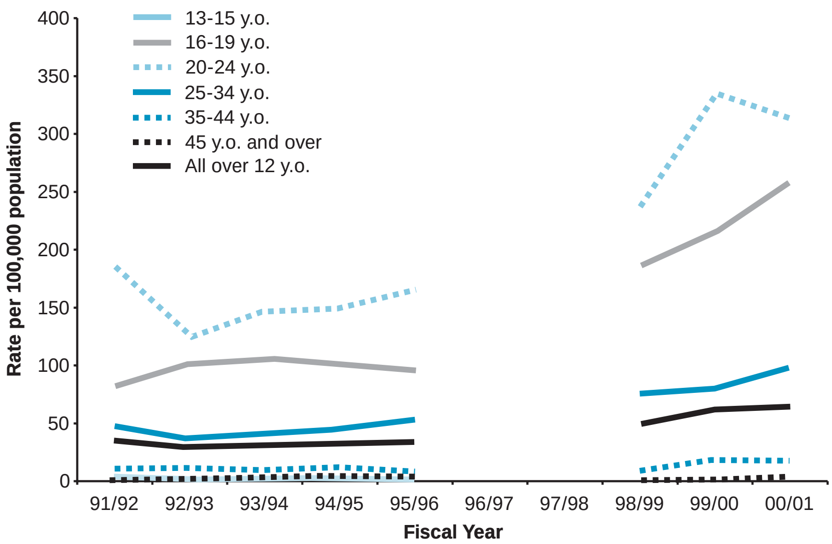


Fig 8.3b: female



* Per 100, 000 population; data for 1996/7 and 1997/8 not available

Source: DHSSPS

Gonorrhoea (uncomplicated)

Diagnoses of gonorrhoeal infection have increased by 182% in Northern Ireland since 1995, which is proportionally the most marked increase of any STI. In 2000/2001, 144 cases of gonorrhoea were diagnosed in Northern Ireland. Despite this, Northern Ireland had the lowest rate of infection in the UK in both males and females in 1999.

Across the UK, the highest rates of gonorrhoea are found in 20-24 year old males and 16-19 year old females. In N Ireland, rates are highest amongst 20-24 year olds of both sexes (Figure 8.4)

Trends in gonorrhoeal infections are considered to reflect trends in sexual behaviour. In England and Wales, 30% of those diagnosed are female suggesting that heterosexual spread is important and rising. In Northern Ireland, 17% of gonorrhoeal infections diagnosed are in females but the numbers remain small (24 diagnoses in 2000/01). It is noted that 81% of women in 2000/01 were under 25 years at diagnosis compared to 47% of males with gonorrhoea.

Figure 8.4 Rate* of diagnosis of uncomplicated gonorrhoeal infection at GUM clinics by gender and age group: 1991-2001, Northern Ireland

Fig 8.4a: male

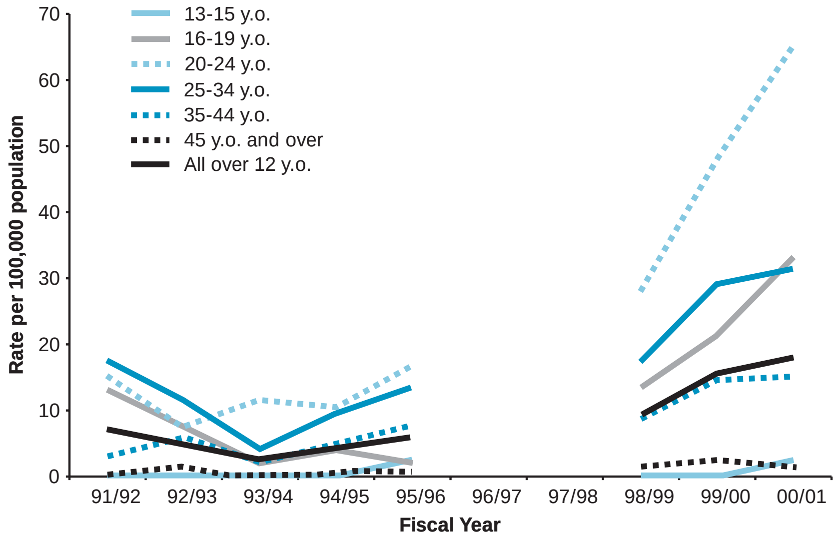
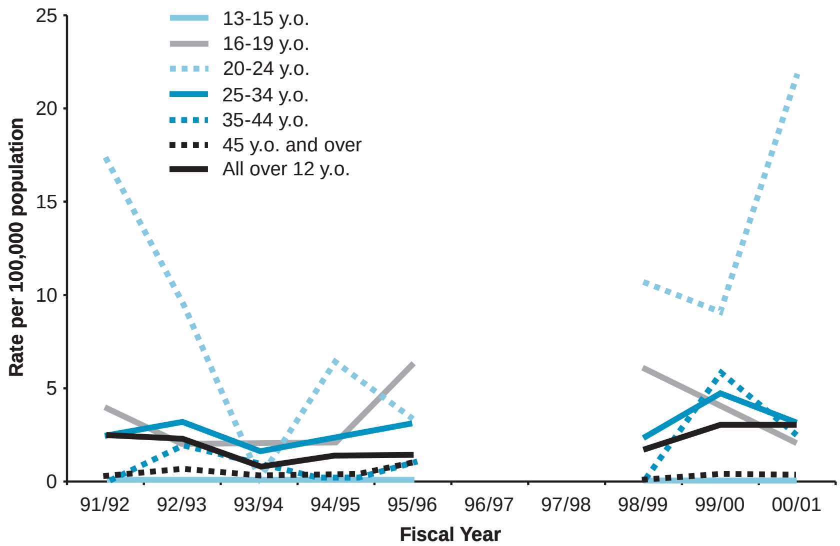


Fig 8.4b: female



* Per 100, 000 population; data for 1996/7 and 1997/8 not available. Note: Axes differ

Source: DHSSPS

Genital herpes simplex virus

Between the 1970s, when genital herpes mainly affected men, and 2000, there has been a substantial increase in diagnoses in the UK. There was a decrease in the 1980s, thought to have been due to greater awareness about HIV infection and safer sex practices. In the early 1990s, for the first time, genital herpes became more common in women.

There were 278 cases diagnosed in Northern Ireland in 2000, the majority (171) in females. In both men and women, the age group in which it is most commonly diagnosed is the 20-24 year old group, although in Northern Ireland 16-19 year olds have shown a dramatic increase. Indeed, the number of cases diagnosed in 16-19 year old females has risen to almost to the level of that in 20-24 year olds (Figure 8.5).

Figure 8.5 Rate* of diagnosis of genital herpes simplex infection at GUM clinics by gender and age group: 1991-2001, Northern Ireland

Fig 8.5a: male

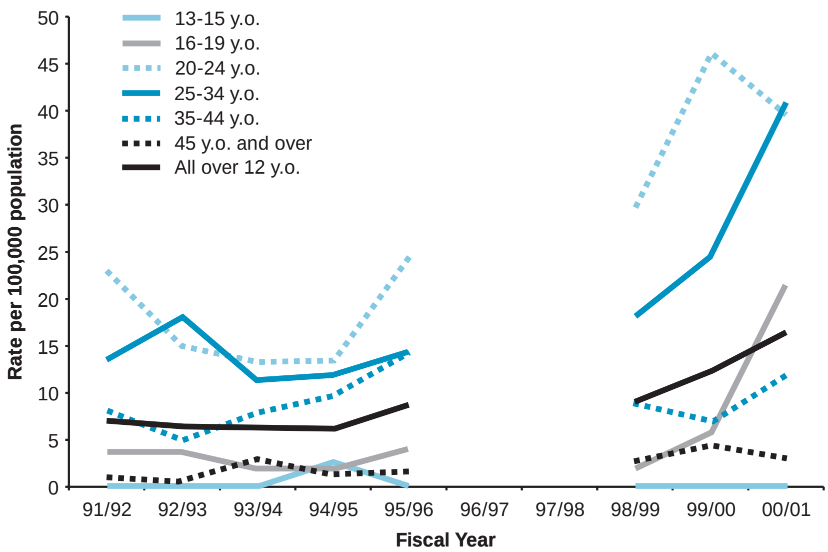
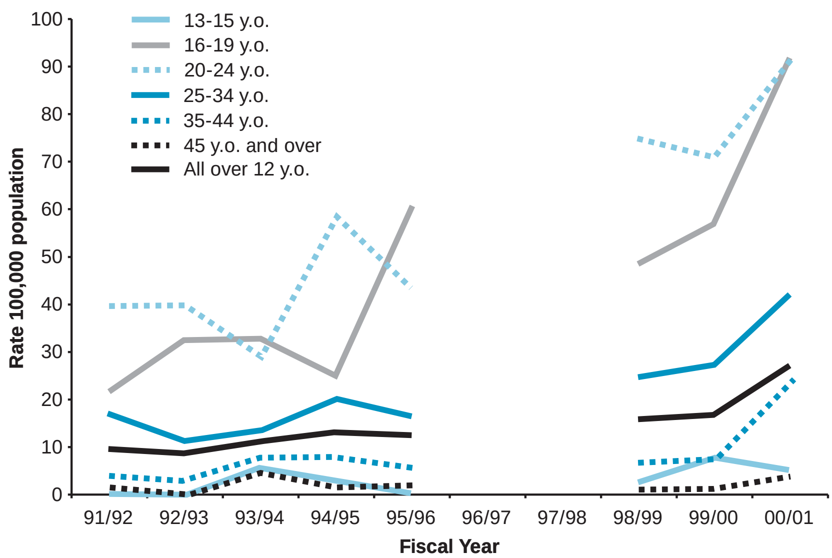


Fig 8.5b: female



* Per 100, 000 population; data for 1996/7 and 1997/8 not available. Note: Axes differ

Source: DHSSPS

Genital warts

Northern Ireland has the lowest rates for most STIs when compared with the rest of the UK. The exception to this is genital warts (first diagnoses). The incidence rate amongst males was the highest of the four UK countries in 1999 (137/100,000), despite the fact that there has been a slight downward trend in numbers diagnosed in males over the last 3 years.

Genital warts are the commonest STI diagnosed at GUM clinics in the UK generally and in Northern Ireland specifically. They represent about 1 in 5 of all acute STIs diagnosed at GUM clinics in 2000 in Northern Ireland. The highest rate of diagnosis, in both males and females, is in the 20-24 year old age group (Figure 8.6).

Figure 8.6 Rate* of diagnosis of genital warts (first attack) at GUM clinics by gender and age group: 1991-2001, Northern Ireland

Fig 8.6a: male

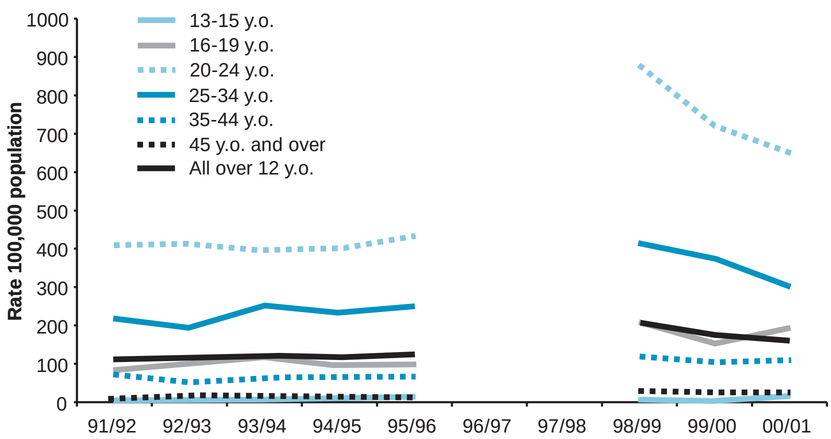
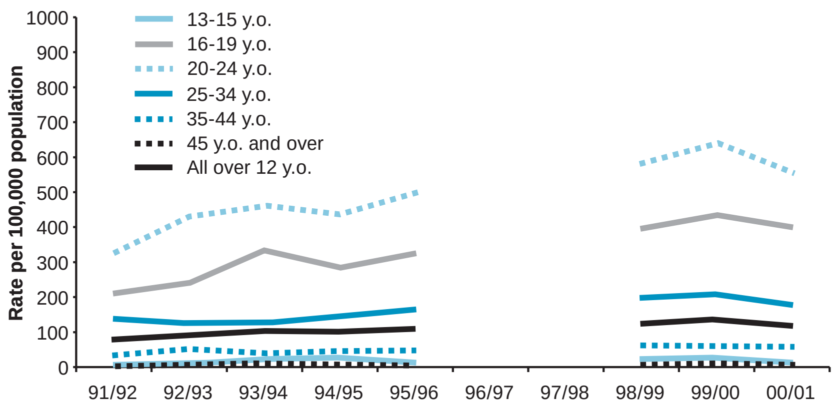


Fig 8.6b: female



* Per 100, 000 population; data for 1996/7 and 1997/8 not available

Source: DHSSPS

HIV/AIDS

In the last decade, throughout the UK, there has been a decrease in diagnosis of symptomatic HIV infection and AIDS, and a decline in deaths, primarily due to increasing uptake of highly active anti-retroviral treatment (HAART). Since new diagnoses of HIV infection have been increasing annually, this has resulted in increasing prevalence of the disease. Because there is as yet no cure, individuals who are diagnosed will need life-long care and treatment.

On a worldwide basis, the epidemiology of HIV infection and AIDS is not uniform. In the UK, men who have sex with men (MSM) are most at risk: with 1,375 new diagnoses reported for the year 2000 by June 2001[4]. In the developing world, heterosexual spread is the most common route.

The rate of diagnosis of HIV infection is relatively low in Northern Ireland compared to other parts of the UK and the Republic of Ireland (Table 8.1). In Northern Ireland the main exposure category for HIV infection remains sex between men and this accounts for 120 (58%) cases. Fifty six (27%) are considered to have acquired infection heterosexually.

By 31 December 2000, there were 87 cases of AIDS first reported from Northern Ireland with 51 (59%) considered to be in the MSM group.

Table 8.1: HIV infected individuals, cumulative rate to end December 2000, UK and ROI

	England	Scotland	Wales	N. Ireland	UK	Republic of Ireland
Cases	39945	2982	640	207	43774	2537
Rate per 100, 000	80	58	22	12	73	67

Source: CDSC (Colindale), NDSC (Dublin)

Table 8.2: HIV infected individuals[1] by country of report and exposure category, cumulative to end December 2000, UK

Country of Report	Sex between men[2]	Sex between men and women		Intravenous drug use		Blood/tissue transfer or blood factor[3]		Other undetermined[4]		Total[5]
	male	**male**	**female**	**male**	**female**	**male**	**female**	**male**	**female**	
England	23930	4489	5713	1684	769	1304	156	1252	606	39945
Wales	355	96	72	23	7	55	3	24	5	640
N. Ireland	120	26	30	4	3	19	1	2	2	207
Scotland	974	295	333	811	358	96	15	67	33	2982
UK	25379	4906	6148	2522	1137	1474	175	1345	646	43774

[1] Individuals with laboratory reports of infection plus those with AIDS or death reports for whom no matching laboratory report has been received

[2] Includes 647 men who have also injected drugs

[3] Includes 5 tissue recipients and 1350 blood factor recipients (mainly males with haemophilia)

[4] Includes 702 children of HIV infected mothers

[5] Includes 42 with sex not stated on report

Source: CDSC (Colindale)

Table 8.3: AIDS cases by country of report and exposure category, cumulative to end December 2000, UK

Country of Report	Sex between men[1]	Sex between men and women		Intravenous drug use		Blood/tissue transfer or blood factor[2]		Other undetermined[3]		Total
	male	**male**	**female**	**male**	**female**	**male**	**female**	**male**	**female**	
England	11056	1618	1528	505	206	638	90	322	207	16170
Wales	150	25	25	7	4	32	3	9	1	256
N. Ireland	51	9	8	2	2	12	1	1	1	87
Scotland	395	91	87	264	105	46	6	20	11	1025
UK	11652	1743	1648	778	317	728	100	352	220	17538

[1] Includes 307 men who have also injected drugs

[2] Includes 3 tissue recipients and 673 blood factor recipients (mainly males with haemophilia)

[3] Includes 387 children of HIV infected mothers

Source: CDSC (Colindale)

Although intravenous drug abuse is thought to be on the increase in Northern Ireland, the number of individuals with HIV who are thought to have acquired infection in this manner has changed relatively little in recent years. However, increasing incidence of Hepatitis C infection has been described among injecting drug users in Northern Ireland and both HIV and Hepatitis C are transmitted by sharing of needles and equipment. It is possible increasing numbers presenting from this risk group will be noted in the future.

Apart from the care of individuals diagnosed with infection, the GUM clinics in Northern Ireland expend a considerable amount of time and resources on counselling of individuals in relation to HIV risk. In 2000/2001, almost 1400 individuals were counselled in relation to HIV testing at the GUM clinics in Northern Ireland.

References

1. PHLS, DHSS&PS and the Scottish ISD(D)S Collaborative Group (2000). Trends in Sexually Transmitted Infections in the United Kingdom, 1990-1999. London, PHLS

2. PHLS, DHSS&PS and the Scottish ISD(D)S Collaborative Group (2001). Trends in Sexually Transmitted Infections in the United Kingdom, 1995-2000. London, PHLS

3. Health Promotion Agency for Northern Ireland (2000). The Health Behaviour of School Children in Northern Ireland – A report on the 1997/98 survey. Belfast, Health Promotion Agency.

4. PHLS CDSC (2001). HIV and AIDS in the UK – An epidemiological review. London, PHLS.

Appendices

Appendix 1

The Communicable Disease Surveillance Centre for Northern Ireland – CDSC (NI)

CDSC (NI) was established at the Belfast City Hospital in 1999. It is one of ten regional units of the Public Health Laboratory Service Communicable Disease Surveillance Centre, London. The other regional units cover England and Wales.

Its remit includes:

- Regional surveillance of communicable disease. This involves collecting details from hospital laboratories of clinically significant infections, statutory notifications of infectious diseases, vaccination uptake rates, statistics from GUM clinics and reports from CCDCs. This data needs to be combined, analysed and interpreted. Some analysis is published weekly (influenza surveillance), others in the monthly report with a more detailed description and commentary in the annual report. Major developments over the next twelve months will include the creation of the CDSC (NI) website where surveillance outputs can be more readily accessed, the rollout of an electronic laboratory reporting system (CoSurv) to facilitate more timely and complete surveillance and the initiation of more comprehensive surveillance on antimicrobial resistance.

- Advice and support to the Department of Health, Social Services and Public Safety (DHSSPS), Health and Social Services Boards and Trusts. CDSC (NI) is represented on the Regional Advisory Committee on Communicable Disease Control and the majority of its sub-committees/working groups. This Committee provides advice to the Chief Medical Officer on communicable diseases.

- Operational support to the Chief Medical Officer and Directors of Public Health. Statutory responsibility for communicable disease control resides with the Director of Public Health in each HSSB and CDSC (NI) can provide assistance and advice during outbreak investigation particularly if the outbreak involves more than one Board area.

- Training. CDSC (NI) is a recognised training location for the EPIET (European Programme for Intervention Epidemiology Training) programme and is currently hosting its second Fellow. The Unit has also received approval to be a training location for public heath doctors from the Faculty of Public Health Medicine. The Unit also enjoys close links with Queen's University and contributes to medical and nursing undergraduate and postgraduate education.

- Research. CDSC (NI) is participating in a PHLS multi – centre case control study of the risk factors associated with sporadic Q fever infection. Q fever is an infection acquired from animals and Northern Ireland has the highest rates of this infection in the UK.

Personnel at CDSC (NI)

Dr Brian Smyth	*Regional Epidemiologist*
Dr Biagio Pedalino	*EPIET Fellow*
Dr Anne Kilgallen	*Specialist Registrar on secondment from North Western Health Board*
Ms Grainne McLaughlin	*Personal Assistant*
Ms Eileen Corey	*Secretary*
Ms Audrey Lynch	*Information Manager*
Dr Julie McCarroll	*Information Officer (Anti-microbial Susceptibility Surveillance)*
Dr Hilary Kennedy	*Information Officer (Influenza Surveillance)*
Mr David McCollum	*Technical Support Officer (CoSurv)*
Ms Ruth Fox	*Information Assistant*

Appendix 2:

Notifications of Infectious Diseases, 1990-2000, Northern Ireland

Disease	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Acute Encephalitis/Meningitis:Bacterial*	106	110	89	105	122	98	69	74	48	82	99
Acute Encephalitis/Meningitis:Viral*	52	62	29	17	22	18	36	17	16	17	31
Anthrax	0	0	0	1	0	0	0	0	0	0	0
Chickenpox *	2744	3578	9955	6699	6138	4785	7004	5253	4907	4584	4531
Cholera	0	0	0	1	1	0	0	0	0	0	0
Diphtheria	0	0	0	0	0	0	0	0	0	0	0
Dysentery	51	66	174	129	136	272	155	29	18	10	24
Food Poisoning	819	636	915	954	1004	1266	1456	1534	1942	2033	2285
Gastro-enteritis (persons under 2)	1157	1091	1070	1379	888	1072	745	896	1371	1121	1205
Hepatitis A*	118	225	194	245	229	92	49	33	91	62	26
Hepatitis B*	6	9	14	7	7	8	15	8	1	4	11
Hepatitis Unspecified:Viral*	189	206	96	43	31	22	15	15	16	12	9
Legionnaires' Disease*	2	1	2	1	1	1	0	2	2	2	1
Leptospirosis*	2	3	1	3	3	0	1	1	2	1	0
Malaria*	4	8	14	8	6	5	14	16	23	13	11
Measles	334	342	303	495	950	263	197	120	112	79	92
Meningococcal Septicaemia*	2	23	27	34	39	42	67	56	87	145	123
Mumps**	187	189	156	115	103	93	67	68	79	93	1006
Paratyphoid Fever	0	0	1	1	2	0	0	1	1	0	0
Plague	0	0	0	0	0	0	0	0	0	0	0
Polio (paralytic)	0	0	0	0	0	0	0	0	0	0	0
Polio (acute)	0	0	0	0	0	0	0	0	0	0	0
Rabies	0	0	0	0	0	0	0	0	0	0	0
Relapsing Fever	0	0	0	0	0	0	0	0	0	0	0
Rubella**	543	357	293	528	408	220	190	127	111	73	62
Scarlet Fever	772	575	525	575	519	502	478	425	486	432	310
Smallpox	0	0	0	0	0	0	0	0	0	0	0
Tetanus	0	0	0	0	1	0	0	1	0	0	0
Tuberculosis (Pulmonary)	94	69	68	69	64	71	51	56	43	44	36
Tuberculosis (Non Pulmonary)	37	27	16	21	29	19	24	19	18	17	22
Typhoid	3	0	0	1	0	0	1	1	2	0	0
Typhus	0	1	0	0	0	0	0	0	0	0	0
Viral Haemorrhagic Fever	0	0	0	0	0	0	0	0	0	0	0
Whooping Cough	285	240	205	134	234	131	148	135	100	108	61
Yellow Fever	0	0	0	0	0	0	0	0	0	0	0

* Only notifiable from 16 April 1990
** Only notifiable from October 1988

Source: DHSSPS

Appendix 3:
Trends in specific reported pathogens, 1990-2000, Northern Ireland

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Gastro-intestinal tract infections											
Campylobacter	244	306	412	361	440	557	653	778	775	862	1001
Clostridium difficile toxin	23	70	80	135	259	323	412	423	481	574	382
Clostridium perfringens	N/A	N/A	8	10	7	2	11	5	12	6	10
Cryptosporidium	204	149	58	177	89	81	98	82	180	181	417
Escherichia coli O 157	1	2	1	2	3	7	14	30	29	54	54
Escherichia coli O 157 (VTEC)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	27	24	49	47
Giardia lamblia	69	49	63	58	40	49	45	24	21	37	30
Listeria	N/A	N/A	4	3	1	5	2	4	6	1	4
Rotavirus	220	272	297	580	176	443	379	585	521	357	510
Total Salmonella	259	159	226	180	282	452	413	432	534	689	425
Salmonella enteritidis	178	47	131	113	131	261	171	169	272	462	235
Salmonella enteritidis PT 4	75	31	108	89	101	226	113	123	207	397	160
Salmonella paratyphi	N/A	N/A	2	1	2	0	0	1	2	0	0
Salmonella typhi	N/A	N/A	0	1	0	1	0	1	1	0	1
Salmonella typhimurium	32	34	47	35	60	119	169	185	177	124	93
Salmonella typhimurium DT 104	0	0	2	4	19	56	121	134	142	66	37
Salmonella other serotypes	49	78	46	30	89	71	73	76	82	103	96
Shigella	20	45	131	111	108	259	154	24	14	12	11
Small Round Structured Virus (SRSV) (Norwalk)	8	23	35	17	28	31	7	11	35	90	68
Respiratory tract infections											
Coxiella burnetii	60	75	38	21	45	53	62	51	44	53	35
Influenza A	62	1	39	89	7	92	131	156	259	419	329
Influenza B	13	51	0	26	2	96	4	88	5	158	31
Mycoplasma pneumoniae	N/A	N/A	59	15	38	47	23	124	111	20	17
Respiratory Syncytial Virus (RSV)	189	478	196	583	578	420	903	1070	651	784	503
Hepatitis A	170	213	143	181	164	91	40	37	70	67	18
Hepatitis B	37	28	34	22	33	30	31	22	18	24	42
Hepatitis C	0	0	0	0	41	58	29	26	38	23	51
Staphylococcus aureus (blood & CSF)	148	187	188	177	231	205	288	238	271	290	355
MRSA (blood & CSF)	0	0	0	0	0	3	26	30	52	68	130
Streptococcus pneumoniae	108	118	80	92	122	126	126	128	105	111	119
Neisseria meningitidis	36	32	38	38	36	59	54	66	72	111	138
Haemophilus influenzae type B	28	29	27	8	3	0	0	1	1	3	1
Mycobacterium bovis	0	0	0	0	7	2	4	2	0	3	0
Mycobacterium tuberculosis	63	48	52	40	49	65	50	37	32	38	26

This is not a complete list of all organisms reported to CDSC (NI), but further information is available on request.

Appendix 4:

Salmonella reports, 1992-2000, Northern Ireland

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Salmonella abaetetutuba	-	-	-	-	-	-	-	-	1
Salmonella aberdeen	-	-	-	-	-	-	2	-	-
Salmonella abony	-	-	-	-	-	-	1	-	-
Salmonella adelaide	-	-	-	-	-	-	1	-	-
Salmonella agama	-	-	1	-	-	-	-	-	-
Salmonella agona	8	5	4	11	7	5	2	4	2
Salmonella alachua	-	-	-	-	-	-	1	-	-
Salmonella anatum	1	-	-	-	-	-	1	2	-
Salmonella bareilly	1	-	-	1	-	4	-	1	-
Salmonella barry	1	-	-	-	-	-	-	-	-
Salmonella blockley	1	-	-	-	-	-	1	1	2
Salmonella bonn	-	-	-	-	1	-	-	-	-
Salmonella bovis-morbificans	-	-	-	-	2	1	-	-	-
Salmonella braenderup	-	-	-	3	-	1	1	5	-
Salmonella brandenburg	1	2	-	-	1	-	-	-	2
Salmonella bredeney	1	-	31	9	10	20	4	10	5
Salmonella california	1	-	-	-	-	-	-	-	-
Salmonella caracas	-	-	-	-	-	-	-	-	1
Salmonella chester	-	-	1	-	-	-	-	-	-
Salmonella coeln	-	-	-	-	-	1	-	-	-
Salmonella corvallis	-	-	-	-	-	-	3	1	-
Salmonella derby	-	-	1	1	-	-	-	-	3
Salmonella drypool	-	-	-	-	-	-	-	-	1
Salmonella dublin	-	-	2	2	3	1	3	1	7
Salmonella emek	-	-	-	1	-	-	1	-	-
Salmonella enteritidis untyped	13	7	3	10	7	12	10	6	13
Salmonella enteritidis PT 1	5	-	4	7	9	16	18	25	27
Salmonella enteritidis PT 1A	-	1	-	-	-	-	1	-	-
Salmonella enteritidis PT 2	-	-	-	-	-	1	-	-	-
Salmonella enteritidis PT 3	-	1	-	-	-	-	-	-	-
Salmonella enteritidis PT 3A	-	-	-	-	-	-	-	-	1
Salmonella enteritidis PT 4	108	89	101	226	113	123	207	397	160
Salmonella enteritidis PT 4A	-	-	-	1	-	-	-	-	-
Salmonella enteritidis PT 4B	-	-	-	-	-	-	-	-	1
Salmonella enteritidis PT 5	-	-	1	2	-	-	2	2	1
Salmonella enteritidis PT 5A	-	1	-	3	-	-	3	-	-
Salmonella enteritidis PT 5B	-	-	-	-	-	-	-	1	-
Salmonella enteritidis PT 6	1	3	5	5	3	-	5	3	2
Salmonella enteritidis PT 6A	4	11	7	2	5	8	9	8	10
Salmonella enteritidis PT 6B	-	-	-	-	-	-	-	2	-
Salmonella enteritidis PT 7	-	-	-	1	-	1	-	2	1
Salmonella enteritidis PT 8	-	-	3	1	11	5	2	6	1
Salmonella enteritidis PT 9	-	-	-	-	1	-	-	-	1
Salmonella enteritidis PT 11	-	-	1	1	-	-	2	-	1
Salmonella enteritidis PT 13A	-	-	-	-	-	-	6	-	-
Salmonella enteritidis PT 14B	-	-	-	-	2	1	1	-	1
Salmonella enteritidis PT 15	-	-	-	-	-	-	1	-	-
Salmonella enteritidis PT 16	-	-	-	-	-	-	1	-	-
Salmonella enteritidis PT 20	-	-	-	-	-	-	-	1	-
Salmonella enteritidis PT 21	-	-	4	-	3	1	1	3	6
Salmonella enteritidis PT 24	-	-	1	-	16	-	-	-	1
Salmonella enteritidis PT 29	-	-	-	-	-	-	1	-	-
Salmonella enteritidis PT 34	-	-	1	1	1	1	1	3	-
Salmonella enteritidis PT 35	-	-	-	1	-	-	1	-	-
Salmonella enteritidis PT 44	-	-	-	-	-	-	-	2	7
Salmonella enteritidis untypable	-	-	-	-	-	-	-	1	1
Salmonella fallowfield	-	-	-	-	-	-	1	-	-
Salmonella gold-coast	1	-	-	-	-	-	-	-	-
Salmonella grumpensis	-	-	-	-	-	-	-	1	-
Salmonella haardt	-	-	1	-	1	-	1	1	-
Salmonella hadar untyped	1	-	1	1	4	4	2	2	1
Salmonella hadar PT 1	-	-	-	-	-	-	2	1	3

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Salmonella hadar PT 2	-	-	-	-	-	2	2	-	1
Salmonella hadar PT 9	-	-	-	1	-	-	-	-	-
Salmonella hadar PT 11	-	-	-	-	-	1	-	1	1
Salmonella hadar PT 13	-	-	-	-	-	-	-	1	1
Salmonella hadar PT 14	1	-	-	-	-	-	-	-	-
Salmonella hadar PT 21	-	-	-	-	1	-	-	1	-
Salmonella hadar PT 32	-	-	-	-	-	-	1	-	-
Salmonella haifa	-	2	-	1	-	-	-	-	-
Salmonella hartford	-	-	-	-	-	-	-	1	-
Salmonella heidelberg	2	1	4	5	2	4	2	5	2
Salmonella herston	1	-	-	-	-	-	-	-	-
Salmonella hidalgo	-	-	-	-	-	-	-	2	-
Salmonella hillbrow	-	-	-	-	-	-	-	1	-
Salmonella ibadan	-	1	-	-	-	-	-	-	-
Salmonella ilala	-	-	-	-	-	-	-	-	1
Salmonella indiana	1	-	-	1	1	-	-	1	-
Salmonella infantis	3	2	-	3	-	1	2	2	3
Salmonella java	-	1	-	-	1	-	-	4	3
Salmonella javiana	-	-	-	-	1	-	-	2	-
Salmonella kapemba	-	-	-	1	-	-	-	-	-
Salmonella kedougou	-	-	-	-	-	-	-	1	-
Salmonella kentucky	-	-	2	4	-	3	1	-	4
Salmonella kisii	-	-	-	-	-	-	-	1	-
Salmonella kottbus	-	-	-	-	2	-	1	-	-
Salmonella labadi	-	-	-	1	-	-	-	-	-
Salmonella lagos	-	-	1	-	1	-	-	-	2
Salmonella livingstone	-	-	-	-	-	-	1	1	2
Salmonella london	-	-	-	1	1	-	-	1	1
Salmonella manhattan	-	-	-	-	-	1	-	-	1
Salmonella mbandaka	1	1	2	1	1	-	-	2	-
Salmonella montevideo	1	-	-	1	-	-	-	1	1
Salmonella muenchen	-	-	1	-	-	-	2	1	-
Salmonella muenster	-	1	-	-	-	-	1	-	3
Salmonella ndolo	-	-	1	-	-	-	-	-	-
Salmonella newport	-	1	1	1	3	3	2	-	-
Salmonella ohio	-	-	2	-	-	-	1	1	-
Salmonella oranienburg	-	-	-	1	-	-	3	-	-
Salmonella orion	-	-	-	-	1	1	-	-	-
Salmonella oslo	-	-	-	-	-	-	-	-	1
Salmonella panama	1	-	1	-	-	2	-	1	1
Salmonella paratyphi A	-	-	-	-	-	-	2	-	-
Salmonella paratyphi A PT 1	-	-	-	-	-	1	-	-	-
Salmonella paratyphi A PT 3	1	-	1	-	-	-	-	-	-
Salmonella paratyphi A PT 4	-	1	-	-	-	-	-	-	-
Salmonella paratyphi A PT 5	-	-	1	-	-	-	-	-	-
Salmonella paratyphi B	1	-	-	-	-	-	-	-	-
Salmonella poona	-	-	-	-	1	1	-	1	1
Salmonella remo	-	-	-	-	-	2	-	-	-
Salmonella rissen	-	-	-	1	-	-	-	-	1
Salmonella rubislaw	-	-	-	-	1	-	-	-	-
Salmonella saint-paul	-	-	1	3	-	-	2	-	-
Salmonella schwarzengrund	-	-	3	2	2	-	2	-	1
Salmonella senftenberg	-	-	1	-	-	1	1	-	-
Salmonella shubra	1	-	-	-	-	-	-	-	-
Salmonella sinstorf	-	-	-	-	-	1	-	-	-
Salmonella sp	2	-	9	4	8	5	8	13	28
Salmonella stanley	-	-	-	-	2	2	2	4	1
Salmonella tennessee	-	-	-	-	-	-	-	2	-
Salmonella thompson untyped	-	-	5	-	1	1	-	-	-
Salmonella thompson PT 1	-	-	-	-	-	-	-	1	-
Salmonella thompson PT 2	-	-	-	1	-	-	-	-	-
Salmonella thompson PT 6	-	-	-	-	-	-	-	3	-
Salmonella thompson PT 23	-	-	-	-	-	-	-	-	1
Salmonella thompson PT 43	-	-	-	-	-	1	-	-	-
Salmonella tounouma	-	-	-	-	-	-	-	1	-
Salmonella tshiongwe	-	-	-	-	-	1	-	-	-
Salmonella typhi PT A	-	1	-	-	-	-	-	-	-
Salmonella typhi PT D 1	-	-	-	-	-	1	-	-	-
Salmonella typhi PT E 1	-	-	-	1	-	-	1	-	1
Salmonella typhimurium untyped	15	5	3	11	8	6	14	7	10
Salmonella typhimurium DT 1	1	-	2	-	-	-	1	3	-
Salmonella typhimurium DT 2	-	-	-	-	-	-	-	3	-

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Salmonella typhimurium DT 4	-	1	1	1	-	-	-	2	-
Salmonella typhimurium DT 8	-	-	-	-	-	-	-	2	-
Salmonella typhimurium DT 9	2	-	-	-	-	-	-	-	-
Salmonella typhimurium DT 10	-	2	-	-	-	-	-	-	-
Salmonella typhimurium DT 11	-	-	-	-	-	-	-	-	1
Salmonella typhimurium DT 12	-	1	-	1	2	2	1	4	6
Salmonella typhimurium DT 17	-	-	-	1	-	-	-	-	-
Salmonella typhimurium DT 18	-	-	-	-	-	-	-	-	1
Salmonella typhimurium DT 32	-	1	-	-	-	-	-	-	-
Salmonella typhimurium DT 40	-	-	-	-	-	-	-	-	2
Salmonella typhimurium DT 41	-	-	-	-	-	1	-	1	1
Salmonella typhimurium DT 49	-	-	-	-	-	-	-	1	1
Salmonella typhimurium DT 49A	-	-	-	1	-	-	-	-	-
Salmonella typhimurium DT 54	-	-	-	-	-	-	-	-	1
Salmonella typhimurium DT 56	1	-	-	-	-	-	-	-	-
Salmonella typhimurium DT 69	1	-	-	-	-	-	-	-	-
Salmonella typhimurium DT 85	-	-	-	-	-	-	-	1	-
Salmonella typhimurium DT 97	-	1	-	-	-	-	-	-	-
Salmonella typhimurium DT 99	-	-	-	-	1	-	1	1	-
Salmonella typhimurium DT 101	-	-	-	-	-	-	1	-	-
Salmonella typhimurium DT 103	-	-	1	-	-	-	-	-	-
Salmonella typhimurium DT 104	2	4	19	56	121	134	142	66	37
Salmonella typhimurium DT 104A	-	-	1	-	-	-	-	-	-
Salmonella typhimurium DT 104B	3	1	1	6	4	15	3	6	4
Salmonella typhimurium DT 104C	-	-	-	-	-	1	-	-	-
Salmonella typhimurium DT 108	-	-	-	-	1	-	-	-	-
Salmonella typhimurium DT 110	-	-	1	-	-	-	-	-	-
Salmonella typhimurium DT 120	-	-	-	1	-	-	1	3	4
Salmonella typhimurium DT 124	-	-	-	1	-	-	-	-	-
Salmonella typhimurium DT 132	-	-	-	-	-	-	-	-	1
Salmonella typhimurium DT 135	-	-	5	3	-	-	-	-	-
Salmonella typhimurium DT 136	-	-	-	-	-	-	-	-	1
Salmonella typhimurium DT 141	1	-	-	-	-	-	-	-	-
Salmonella typhimurium DT 145	-	-	-	-	1	-	-	-	-
Salmonella typhimurium DT 146	-	-	-	-	-	-	-	1	-
Salmonella typhimurium DT 161	-	1	-	-	-	-	-	-	-
Salmonella typhimurium DT 167	-	-	-	-	1	-	-	-	-
Salmonella typhimurium DT 170	1	1	3	9	-	1	-	3	-
Salmonella typhimurium DT 177	5	1	-	-	-	-	-	-	1
Salmonella typhimurium DT 186	-	-	-	-	-	-	-	1	-
Salmonella typhimurium DT 193	10	3	10	12	17	8	5	10	13
Salmonella typhimurium DT 195	-	1	-	4	3	2	2	-	1
Salmonella typhimurium DT 197	-	1	-	-	-	-	-	-	-
Salmonella typhimurium DT 204	-	1	6	1	-	-	-	-	-
Salmonella typhimurium DT 204A	1	6	-	-	1	-	1	-	-
Salmonella typhimurium DT 208	2	2	6	9	6	14	1	5	2
Salmonella typhimurium RDNC	1	-	-	-	-	1	2	-	-
Salmonella typhimurium U	-	-	-	-	-	-	-	1	-
Salmonella typhimurium U 285	-	2	-	-	-	-	-	-	-
Salmonella typhimurium U 288	-	-	-	1	-	-	-	-	-
Salmonella typhimurium U 296	-	-	-	-	-	-	2	-	-
Salmonella typhimurium U 302	-	-	-	-	-	-	-	-	4
Salmonella typhimurium U 303	-	-	-	-	-	-	-	1	-
Salmonella typhimurium U 310	-	-	-	-	-	-	-	1	-
Salmonella typhimurium U 311	-	-	-	-	-	-	-	-	2
Salmonella typhimurium untypable	1	-	1	1	3	-	-	1	-
Salmonella tyresoe	-	-	1	-	-	-	-	-	-
Salmonella unnamed	2	-	1	-	1	1	3	4	1
Salmonella virchow untyped	12	5	4	5	6	3	12	9	1
Salmonella virchow PT 4	-	-	-	1	-	-	-	-	-
Salmonella virchow PT 8	-	1	4	2	5	1	-	3	3
Salmonella virchow PT 15	-	-	-	-	-	-	-	-	2
Salmonella virchow PT 23	-	1	-	-	-	-	-	-	-
Salmonella virchow PT 25	-	5	-	-	-	-	-	-	-
Salmonella virchow PT 26	1	-	-	-	2	-	3	-	-
Salmonella virchow PT 31	-	-	1	-	-	-	-	-	-
Salmonella virchow PT 45	-	-	2	-	-	-	-	-	-
Salmonella weltevreden	-	1	-	-	-	-	2	-	-
Salmonella worthington	-	-	-	-	-	1	1	1	-
Salmonella zanzibar	-	-	-	1	-	-	-	-	-
TOTAL	**226**	**180**	**282**	**452**	**413**	**432**	**534**	**689**	**425**

Appendix 5:
List of Reporting Laboratories, Northern Ireland

Altnagelvin Area Hospital

Antrim Laboratory

Belfast City Hospital

Belfast Virus Laboratory

Belvoir Park Hospital

Causeway Laboratory

Craigavon Area Laboratory

Erne Hospital

Mater Infirmorum Hospital

Musgrave Park Hospital

Regional Mycology Laboratory

Royal Victoria (Bacteriology)

Tyrone County Hospital

Ulster Hospital