Health Protection Surveillance Centre

Report on the Epidemiology of Tuberculosis in Ireland 2006

Epidemiology of Tuberculosis in Ireland 2006

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Introduction

The World Health Organization (WHO) has estimated that globally, there were 9.2 million new cases of tuberculosis (TB) in 2006, of which 4.1 million were smear positive. Approximately 1.7 million TB deaths occurred globally in 2006.[1]

In 2006, 422,830 cases of TB were notified to EuroTB by 51 of the 53 countries of the WHO European region.[2] The overall notification rate was 47.7 cases per 100,000 population with very diverse epidemiological situations evident across the region. Figure 1 displays a map of TB notifications rates in the WHO European region.

The lowest rate in the region occurred in Western Europe (EU countries plus Andorra, Iceland, Israel, Norway and Switzerland) at 17.4 per 100,000 population. The overall notification rate for Western Europe declined by 15% since 2002 despite rates being up to four times higher in the new EU accession states, reflecting a net decline in 21 countries. Rates were lower than 10 per 100,000 population in 15 countries and higher than 25 per 100,000 population in the Baltic States – Estonia (34), Latvia (58) and Lithuania (75), as well as Portugal (32), Bulgaria (42) and Romania (127). The notification rate was much higher in Romania than in other countries in Western Europe (range 4.4 to 75.1 per 100,000 population). In the EU and Western Europe, 20% of TB cases were of foreign origin (ranging from 0% to 100%). The proportion of multidrug-resistance (MDR) remained more frequent in the Baltic States with a mean of 16.1% (country range: 14.7% to 18.6%) compared to a mean of 1.7% (0% to 7.1%) in the other Western European countries.

The seven Balkan countries in Central Europe (Albania, Bosnia and Herzegovina, Croatia, F.Y.R. of Macedonia, Montenegro, Serbia and Turkey) reported 26,911 cases of TB in 2006, corresponding to an overall notification rate of 28.1 per 100,000 population. Drug resistance data from these countries indicated low levels of drug resistance where drug sensitivity testing is routinely performed.

In 2006, 306,887 cases were reported from Eastern Europe (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Rep. of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan), of which half were from the Russian Federation. The Russian Federation is the only European country which features in the WHO list of 22 high TB-burden countries in the world. The overall notification rate in Eastern Europe was 110.3 per 100,000 population and has increased on average by 3.2% annually between 2002 and 2006. Data on drug resistance in recent years suggest high levels of MDR in most countries in this region.

In Ireland, national epidemiological data on TB have been collated by the Health Protection Surveillance Centre (HPSC) since 1998. From January 2000, this information has included enhanced surveillance data items based on the minimum dataset reported to the European Centre for Disease Prevention and Control (ECDC). The resulting National Tuberculosis Surveillance System (NTBSS) was set up following consultation with the eight former health boards and the National TB Advisory Committee. The National TB Advisory Committee was reconvened in October 2004 and is currently finalising new guidelines for TB prevention and control in Ireland.

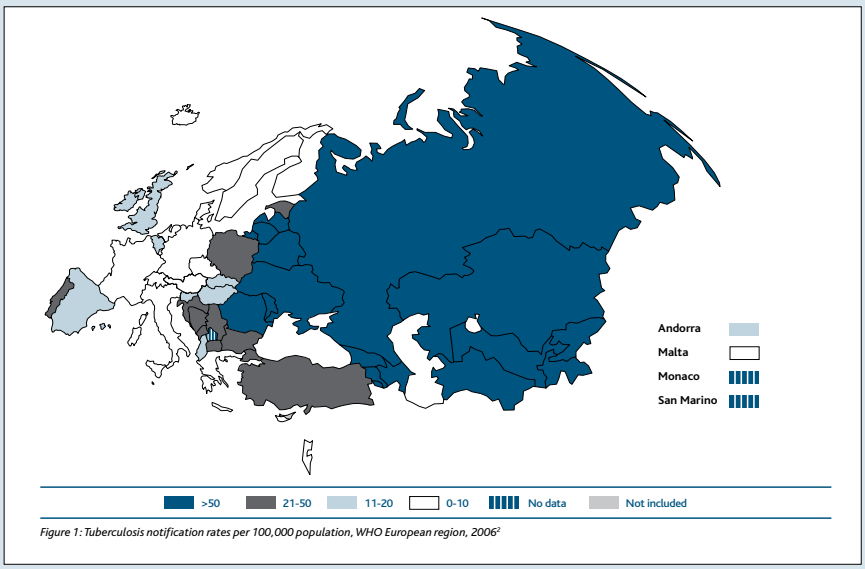

Figure 1: Tuberculosis notification rates per 100,000 population, WHO European region, 2006[2]

This report presents an epidemiological review of all TB cases notified in 2006. Data for 2006 have been validated and updated to include information relating to treatment outcome. Provisional data for 2007 are presented in Appendix 1.

Case Definitions

The case definitions used for the analyses described in this report were those recommended by the Commission of the European Communities (2008).[3]

Tuberculosis (*Mycobacterium tuberculosis* complex including; *M. tuberculosis. M. africanum, M. bovis, M. canetti, M. caprae, M. microti* and *M. pinnipedii*)

- **Clinical Criteria –** Any person with:
  - Signs, symptoms and/or radiological findings consistent with active tuberculosis in any site

    AND
  - A clinician's decision to treat the person with a full course of anti-tuberculosis therapy

    OR
  - A case discovered post-mortem with pathological findings consistent with active tuberculosis that would have indicated anti-tuberculosis antibiotic treatment had the patient been diagnosed before dying

- **Possible case** – A person meeting the clinical criteria without laboratory confirmation
- **Probable case** – A person meeting the clinical criteria with at least one of the following:
  - Microscopy positive for acid-fast bacilli or equivalent fluorescent staining bacilli on light microscopy

    OR
  - Detection of *Mycobacterium tuberculosis* nucleic acid in a clinical specimen

    OR
  - Histological appearance of granulomata
- **Confirmed case** – A person meeting the clinical criteria with at least one of the following two:
  - Isolation of *M. tuberculosis* complex (excluding *M. bovis*-BCG) from a clinical specimen

    OR
  - Detection of *M. tuberculosis* nucleic acid in a clinical specimen

    AND
  - Positive microscopy for acid-fast bacilli or equivalent fluorescent staining bacilli on light microscopy
- **Pulmonary TB** is defined as TB of the lung parenchyma or the tracheo-bronchial tree. The WHO defines pulmonary TB, for the purpose of analysis, as any case that has a pulmonary disease component
- **Extra-pulmonary TB** is defined as a patient with tuberculosis affecting any site other than pulmonary as defined above
- **Pulmonary and extra-pulmonary TB** is a case of tuberculosis that met the previous two definitions
- **Smear positive case**[4] is defined as a patient with the presence of at least one acid fast bacillus (AFB+) in at least one sputum sample in countries with a well functioning external quality assurance (EQA) system
- **A recurrent case** is defined as a patient with a documented history of TB prior to their 2006 notification
- **Multidrug-resistant (MDR-TB)** is defined as a TB case resistant to at least isoniazid and rifampicin with or without resistance to ethambutol and streptomycin
- **Extensively drug-resistant TB (XDR-TB)** is defined as a TB strain resistant to any fluoroquinolone and at least one of three injectable second-line drugs (capreomycin, kanamycin and amikacin), in addition to MDR-TB. This definition of XDR-TB was agreed by the WHO Global Task Force on XDR-TB in October 2006.[5]

Methods

Data collection

An enhanced TB notification form was completed by public health doctors for each case of TB notified in 2006. These forms summarise all available clinical, microbiological, histological and epidemiological data. Forms were then collated in the regional departments of public health, where data were entered onto an Epi2000 database (NTBSS). Each HSE area provided finalised 2006 data with outcome information to HPSC in early to mid-2008. Data were validated with each area and national data were collated. Provisional 2007 data were obtained from each area in July 2008.

Data analysis

National TB data from 1992 to 1997 were provided by the Department of Health and Children (DoHC). National TB data from 1998 onwards were obtained from the NTBS system.

Rates for 1991, 1992 and 1993 are based on the 1991 population census; rates for 1994, 1995, 1996, 1997, 1998 and 1999 are based on the 1996 population census; rates for 2000, 2001, 2002 and 2003 are based on the 2002 population census and rates for 2004, 2005, 2006 and 2007 are based on the 2006 population census. For the calculation of rates in the indigenous and foreign-born population, population data were taken from table 32, volume 4, 2006 census, 'persons usually resident in each province and county, and present in the state on census night, classified by place of birth'. The indigenous population was defined as those persons who were born in Ireland.[6]

Direct methods of standardisation were used to allow comparison of rates between geographical areas using the 2006 Irish population as the standard population. In order to compare rates between groups of interest, 95% confidence intervals were used.

Three-year moving averages were calculated by applying the formula (a+2b+c)/4 to each three successive points a, b and c (each letter representing a year) in the series. They are useful for smoothing irregularities in trend data and make it easier to discern long-term trends that otherwise might be obscured by short-term fluctuations.

For 2007 data, analysis was performed using local health office (LHO) denominators rather than community care area (CCA) denominators. The LHOs came into operation on 1st September 2005.

Results: TB cases in Ireland, 2006

Overall cases and rates

There were 465 cases of TB notified in 2006, a rate of 11.0 per 100,000 population. A summary of the 2006 data is shown in table 1.

Table 1: Summary of the epidemiology of TB in Ireland, 2006

Parameter	Number
Total number of cases	465
Crude notification rate per 100,000	11.0
Cases in indigenous population*	294
Cases in foreign-born persons*	161
Culture positive cases	317
Smear positive pulmonary cases	155
Multidrug-resistant cases	4
Mono-resistant to isoniazid	14
Deaths attributable to TB	10
Outcomes reported in cases	367
TB meningitis cases	7

**Country of birth not available for ten cases*

The number of TB cases notified for each of the years from 1991-2006 is shown in table 2. Crude incidence rates from 1991 to 2006 with three-year moving averages are also shown in table 2.

Table 2: Notified cases of TB in Ireland 1991-2006 with crude rates per 100,000 population and 3-year moving averages 1992-2005

Year	Number of cases	Crude rate per 100,000 population	3-year moving average
1991	640	18.2	
1992	604	17.1	612
1993	598	17.0	581
1994	524	14.5	526
1995	458	12.6	469
1996	434	12.0	436
1997	416	11.5	423
1998	424	11.7	433
1999	469	12.9	439
2000	395	10.1	410
2001	381	9.7	391
2002	408	10.4	401
2003	407	10.4	414
2004	432	10.2	430
2005	450	10.6	449
2006	465	11.0	

Crude incidence rates by HSE area

The total number of TB cases in each HSE area is shown in table 3 with crude incidence rates and 95% confidence intervals included. The highest crude rate was reported in HSE S at 15.3 per 100,000 population, which was significantly higher than the national rate. The next highest rates were reported in HSE E (12.9), HSE SE (11.1) and HSE MW (10.2). The rates in HSE NW (3.8) and HSE M (6.0) were significantly lower than the national rate.

The crude incidence rates seen in each HSE area from 1992 to 2006 are shown in table 4 while the 3-year moving average TB notification rates for each HSE area from 1992 to 2005 are shown in table 5.

Table 3: Notified TB cases by HSE area, 2006

HSE area	Cases	Crude rate per 100,000	95% CI for rate
HSE E	193	12.9	11.1 - 14.7
HSE M	15	6.0	2.9 – 9.0
HSE MW	37	10.2	6.9 - 13.6
HSE NE	33	8.4	5.5 - 11.2
HSE NW	9	3.8	1.3 - 6.3
HSE S	95	15.3	12.2 - 18.4
HSE SE	51	11.1	8.0 - 14.1
HSE W	32	7.7	5.0 - 10.4
Ireland	**465**	**11.0**	**10.0 - 12.0**

Table 4: Crude TB incidence rates per 100,000 population by HSE area, 1992-2006

Year	HSE E	HSE M	HSE MW	HSE NE	HSE NW	HSE S	HSE SE	HSE W	National
1992	16.1	18.7	20.9	10.0	15.9	21.4	12.3	22.2	17.1
1993	11.9	10.8	16.1	10.0	37.5	23.9	16.7	23.0	17.0
1994	12.9	14.6	17.3	11.4	9.0	17.4	11.0	22.7	14.5
1995	11.9	8.8	15.1	8.5	11.4	20.5	9.5	11.1	12.6
1996	8.7	8.3	17.7	12.1	7.1	22.5	6.9	13.1	12.0
1997	9.9	9.2	12.6	9.1	10.4	16.5	12.8	11.1	11.5
1998	11.7	4.9	14.8	9.5	9.0	14.3	8.9	15.3	11.7
1999	13.9	7.3	17.0	8.2	9.0	13.7	7.9	19.9	12.9
2000	10.2	7.1	13.8	6.1	4.1	13.8	9.7	10.0	10.1
2001	12.3	3.1	7.1	11.0	5.9	12.4	4.7	8.9	9.7
2002	11.6	8.4	9.4	7.0	5.4	13.3	11.6	8.7	10.4
2003	11.9	5.3	12.4	7.5	4.1	16.0	8.3	6.0	10.4
2004	12.6	3.6	12.2	5.8	6.7	11.8	7.4	10.6	10.2
2005	13.0	6.4	14.7	3.3	6.3	12.2	8.0	10.9	10.6
2006	12.9	6.0	10.2	8.4	3.8	15.3	11.1	7.7	11.0

Table 5: 3-year moving average TB notification rate per 100,000 population by HSE area, 1992-2005

Year	HSE E	HSE M	HSE MW	HSE NE	HSE NW	HSE S	HSE SE	HSE W	Total
1992	14.7	16.1	20.3	10.1	20.2	21.7	12.6	26	17.3
1993	13.2	13.7	17.6	10.4	24.9	21.6	14.2	22.7	16.4
1994	12.4	12.2	16.5	10.3	16.7	19.8	12.0	19.9	14.6
1995	11.3	10.1	16.3	10.1	9.7	20.2	9.2	14.5	12.9
1996	9.8	8.6	15.8	10.5	9.0	20.5	9.0	12.1	12.0
1997	10.1	7.9	14.4	10.0	9.2	17.4	10.3	12.6	11.7
1998	11.8	6.6	14.8	9.1	9.4	14.7	9.6	15.4	11.9
1999	12.4	6.6	15.7	8.0	7.8	13.9	8.6	16.3	11.9
2000	11.7	6.2	12.9	7.8	5.8	13.4	8.0	12.2	10.7
2001	11.6	5.4	9.3	8.8	5.3	13.0	7.7	9.1	10.0
2002	11.8	6.3	9.6	8.1	5.2	13.7	9.0	8.1	10.2
2003	12.0	5.7	11.6	7.0	5.1	14.3	8.9	7.8	10.3
2004	12.5	4.7	12.9	5.6	6.0	12.9	7.8	9.5	10.3
2005	12.9	5.6	12.9	5.2	5.8	12.9	8.6	10.0	10.6

Age and sex distribution

There were 280 (60.2%) cases of TB notified in males in 2006 and 185 (39.8%) in females, giving a male to female ratio of 1.5:1. Table 6 gives the breakdown of notified TB cases by sex and HSE area.

In 2006, the median age of cases was 45 years (range 0 year to 93 years). Age was not reported for two cases. One hundred and twenty-three cases (26.5%) were aged between 25 and 34 years and 84 cases (18.1%) were aged 65 years and over. Table 7 describes the age-specific rates for males and females in 2006. Rates in males were higher than females in all age groups except in the 15-24 year age group. Figure 2 shows the cases by age and sex and the male and female age-specific rates in Ireland for 2006. Figure 3 shows the age-specific rates of TB in Ireland from 2000 to 2006.

Table 6: TB cases by HSE area and sex, 2006

HSE area	Male	Female	Male:female ratio
HSE E	106	87	1.2
HSE M	9	6	1.5
HSE MW	24	13	1.8
HSE NE	15	18	0.8
HSE NW	7	2	3.5
HSE S	61	34	1.8
HSE SE	37	14	2.6
HSE W	21	11	1.9
Ireland	280	185	1.5

Table 7: Age-specific TB rates per 100,000 population for males and females, 2006

Age group (years)	Female	Male	Total
0-14	1.9	2.9	2.4
15-24	11.9	8.4	10.1
25-34	16.6	17.5	17.0
35-44	8.4	17.1	12.8
45-54	4.6	12.6	8.6
55-64	5.5	17.0	11.3
65+	11.9	25.6	18.0
Total	8.7	13.2	11.0

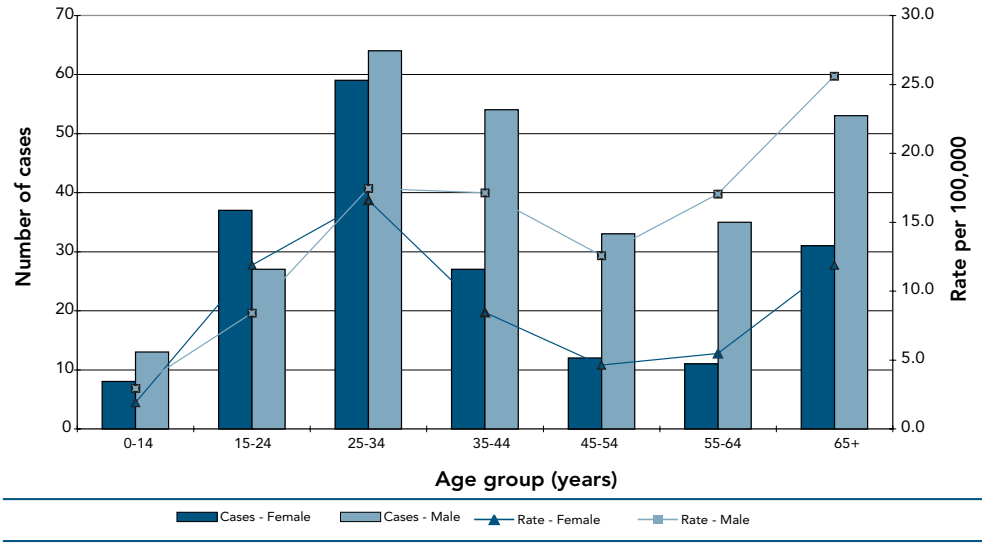

Figure 2: Cases of TB by age and sex, and age-specific rates per 100,000 population, 2006

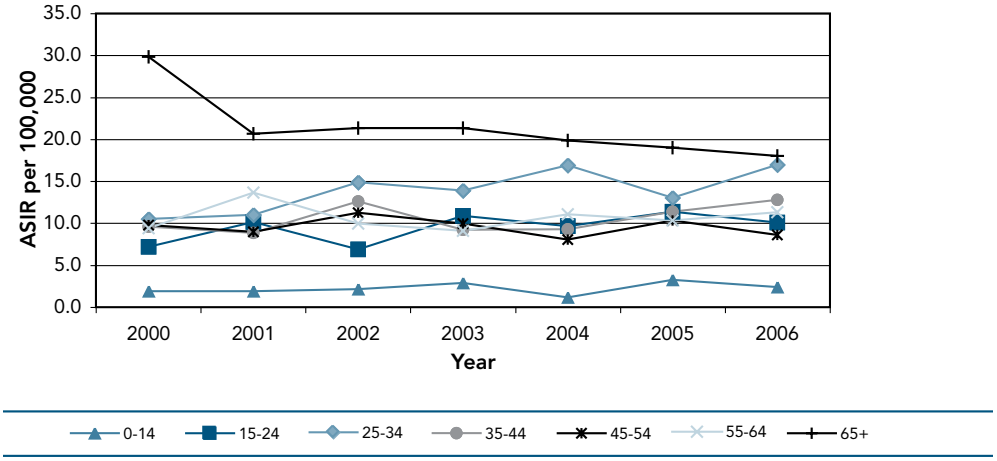

Figure 3: Age-specific rates of TB by year, 2000-2006

Age-standardised TB incidence rates by HSE area, county and LHO

Age-standardised TB incidence rates for each HSE area are presented in figures 4 and 5 (figure 4 includes 95% confidence intervals).

The highest age-standardised TB incidence rates were seen in HSE S at 15.3 per 100,000 population, followed by HSE E (12.6) and HSE SE (11.1). HSE NW and HSE M reported the lowest age-standardised rates at 4.0 and 6.2 per 100,000 population respectively. Both rates were significantly lower than the national incidence rate of 11.0 per 100,000 population.

Age-standardised incidence rates for each county are shown in table 8 and figure 6 (95% confidence intervals are included in table 8). Cork had a significantly higher rate (17.9) than the national figure (11.0). Counties with significantly lower incidence rates than the national rate were Donegal (2.7) and Longford (3.1). No cases were reported from counties Carlow or Leitrim.

Crude incidence rates for each local health office (LHO)* in 2006 are shown in table 9. Three-year moving averages for the crude incidence rates are presented in table 10. In 2006, the highest crude rates per

* Note: LHOs came into operation on 1st September 2005, taking over operations from CCAs

100,000 population were in North Lee (28.0) in HSE S, Dublin North Central LHO (26.9) and in Dublin North West LHO (21.0) in HSE E. The highest 3-year moving average rates between 2003 and 2005 were in Dublin South City, Dublin West, Dublin North West and Dublin North Central LHOs in HSE E, and North Lee in HSE S.

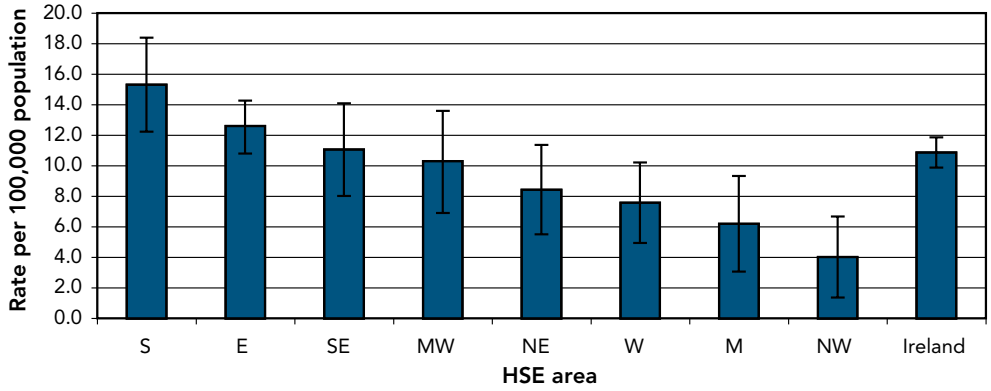

Figure 4: Age-standardised TB incidence rates per 100,000 population by HSE area with 95% confidence intervals, 2006

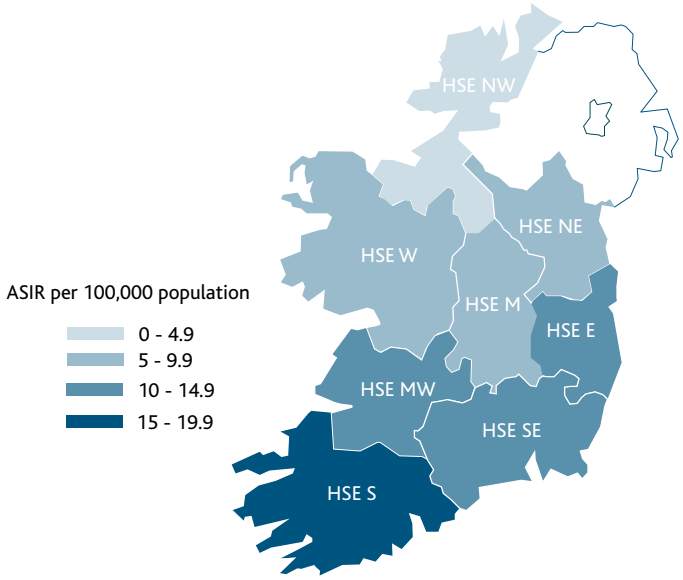

Figure 5: Age-standardised TB incidence rates per 100,000 population by HSE area, 2006

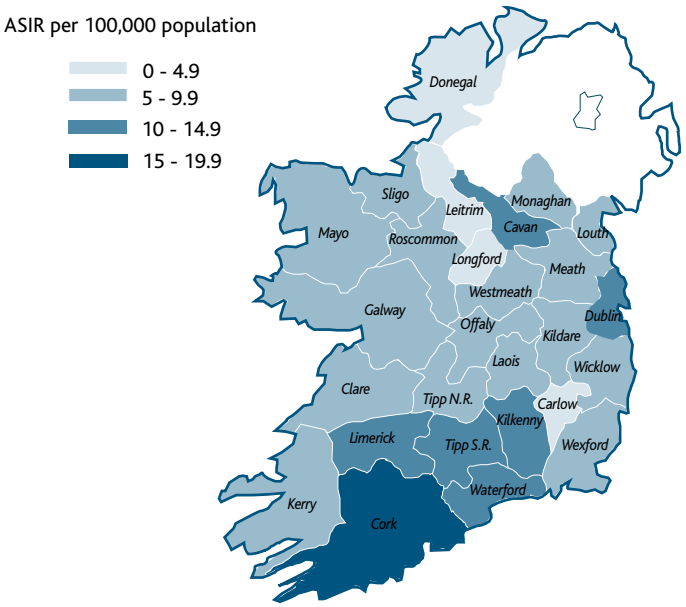

Figure 6: Age-standardised TB incidence rates per 100,000 population by county, 2006

Table 8: Age-standardised TB incidence rates per 100,000 population by county with 95% confidence intervals, 2006

County	ASIR per 100,000	95% CI
Cork	17.9	14.1 - 21.6
Tipperary Sth	14.6	6.3 - 22.9
Waterford	14.6	7.4 - 21.7
Dublin	13.9	11.8 - 16.0
Limerick	11.8	6.9 - 16.8
Kilkenny	10.3	3.6 - 17.0
Cavan	10.2	2.0 - 18.5
Tipperary Nth	9.7	1.9 - 17.6
Meath	9.4	4.4 - 14.4
Sligo	9.0	1.0 - 16.9
Galway	7.6	4.1 - 11.2
Clare	7.6	2.6 - 12.5
Louth	7.4	2.3 - 12.6
Offaly	7.3	0.9 - 13.7
Kildare	7.2	3.4 - 11.0
Roscommon	7.1	0.8 - 13.3
Monaghan	7.1	0.1 - 14.0
Westmeath	6.6	0.8 - 12.4
Wexford	6.6	2.0 - 11.1
Kerry	6.6	2.2 - 10.9
Wicklow	6.5	2.0 - 11.1
Mayo	6.5	2.2 - 10.8
Laois	6.2	0.1 - 12.2
Longford	3.1	-3.0 - 9.3
Donegal	2.7	0 - 5.4
Leitrim	0.0	0 - 0
Carlow	0.0	0 - 0

Table 9: Crude incidence rate per 100,000 population by local health office (LHO), 2000 to 2006

		Rate per 100,000 population						
HSE area	LHO†	2000	2001	2002	2003	2004	2005	2006
HSE E	**Total**	**10.2**	**12.3**	**11.6**	**11.9**	**12.6**	**13.0**	**12.9**
	Dun Laoghaire	5.4	2.3	4.7	4.7	9.5	4.0	5.5
	Dublin South East	13.3	5.7	7.6	7.6	10.9	7.2	5.4
	Dublin South City	7.7	26.1	21.5	23.0	23.1	20.1	19.4
	Dublin South West	6.9	8.2	7.5	10.3	8.1	12.2	5.4
	Dublin West	11.9	10.3	18.3	19.1	20.1	18.7	17.9
	Dublin North West	16.8	18.7	23.0	17.4	12.9	19.4	21.0
	Dublin North Central	18.8	27.8	18.8	21.2	25.3	24.5	26.9
	Dublin North	10.8	11.8	5.4	4.9	11.3	10.4	11.7
	Kildare/West Wicklow	5.0	5.0	7.8	8.4	5.4	7.9	6.9
	Wicklow	5.0	8.0	1.0	5.0	2.7	5.5	8.2
HSE M	**Total**	**7.1**	**3.1**	**8.4**	**5.3**	**3.6**	**6.4**	**6.0**
	Longford/Westmeath	8.7	6.8	7.8	7.8	4.4	8.8	5.3
	Laois/Offaly	5.7	0.0	9.0	3.3	2.9	4.4	6.5
HSE MW	**Total**	**13.8**	**7.1**	**9.4**	**12.4**	**12.2**	**14.7**	**10.2**
	Clare	11.6	5.8	9.7	6.8	10.8	19.8	8.1
	Limerick‡	na	na	na	na	na	na	na
	Tipperary Nth East Limerick‡	na	na	na	na	na	na	na
HSE NE	**Total**	**6.1**	**11.0**	**7.0**	**7.5**	**5.8**	**3.3**	**8.4**
	Cavan/Monaghan	3.1	16.7	6.3	10.4	4.2	5.1	8.4
	Louth/Sth Monaghan	11.4	8.8	10.5	9.6	9.0	3.6	7.2
	Meath	3.7	9.0	4.5	3.7	4.9	1.8	9.2
HSE NW	**Total**	**4.1**	**5.9**	**5.4**	**4.1**	**6.7**	**6.3**	**3.8**
	Donegal	2.9	3.6	4.4	2.9	6.8	4.1	2.7
	Sligo/Leitrim	5.9	9.4	7.0	5.9	6.6	9.9	5.5
HSE SE	**Total**	**9.7**	**4.7**	**11.6**	**8.3**	**7.4**	**8.0**	**11.1**
	Carlow/Kilkenny	13.5	8.1	8.1	9.0	7.5	6.6	7.5
	Tipperary Sth	10.7	2.4	4.7	9.5	7.9	13.6	20.4
	Waterford	12.6	7.2	23.3	11.7	13.3	9.2	13.3
	Wexford	2.6	0.9	8.6	3.4	1.5	4.6	6.1
HSE S	**Total**	**13.8**	**12.4**	**13.3**	**16.0**	**11.8**	**12.2**	**15.3**
	Kerry	8.3	6.8	10.6	12.1	10.0	6.4	6.4
	North Cork	21.8	9.5	15.0	10.9	12.4	6.2	8.7
	North Lee	16.7	21.8	18.6	22.4	14.9	21.5	28.0
	South Lee	10.7	10.7	12.5	19.7	11.2	11.7	16.2
	West Cork	13.8	7.9	3.9	2.0	7.5	9.3	5.6
HSE W	**Total**	**10.0**	**8.9**	**8.7**	**6.0**	**10.6**	**10.9**	**7.7**
	Galway	10.5	10.0	5.7	5.3	9.9	11.2	8.2
	Mayo	8.5	4.3	10.2	8.5	7.3	9.7	7.3
	Roscommon	11.2	14.9	16.7	3.7	20.4	11.9	6.8
Total		**10.1**	**9.7**	**10.4**	**10.4**	**10.2**	**10.6**	**11.0**

† In some areas, LHO does not always correspond to county

‡ Rates cannot be calculated for these LHOs as the population in the LHO is not known

Table 10: 3-year moving average TB notification rate per 100,000 population by LHO, 2001 to 2005

HSE area	LHO†	3-year moving average				
		2001	2002	2003	2004	2005
HSE E	**Total**	**11.6**	**11.8**	**12.0**	**12.5**	**12.9**
	Dun Laoghaire	3.7	4.1	5.9	6.9	5.7
	Dublin South East	8.1	7.1	8.4	9.1	7.7
	Dublin South City	20.3	23.0	22.6	22.3	20.7
	Dublin South West	7.7	8.4	9.1	9.7	9.5
	Dublin West	12.7	16.5	19.2	19.5	18.8
	Dublin North West	19.3	20.6	17.7	15.7	18.2
	Dublin North Central	23.3	21.6	21.6	24.1	25.3
	Dublin North	9.9	6.9	6.6	9.4	10.9
	Kildare/West Wicklow	5.7	7.3	7.5	6.8	7.0
	Wicklow	5.5	3.8	3.4	4.0	5.5
HSE M	**Total**	**5.4**	**6.3**	**5.7**	**4.7**	**5.6**
	Longford/Westmeath	7.5	7.5	6.9	6.3	6.8
	Laois/Offaly	3.7	5.3	4.6	3.4	4.5
HSE MW	**Total**	**9.3**	**9.6**	**11.6**	**12.9**	**12.9**
	Clare	8.2	8.0	8.5	12.1	14.6
	Limerick‡	na	na	na	na	na
	Tipperary Nth/East Limerick‡	na	na	na	na	na
HSE NE	**Total**	**8.8**	**8.1**	**7.0**	**5.6**	**5.2**
	Cavan/Monaghan	10.7	9.9	7.8	6.0	5.7
	Louth/Sth Monaghan	9.9	9.9	9.7	7.8	5.8
	Meath	6.5	5.4	4.2	3.8	4.5
HSE NW	**Total**	**5.3**	**5.2**	**5.1**	**6.0**	**5.8**
	Donegal	3.6	3.8	4.2	5.1	4.4
	Sligo/Leitrim	7.9	7.3	6.3	7.2	8.0
HSE SE	**Total**	**7.7**	**9.0**	**8.9**	**7.8**	**8.6**
	Carlow/Kilkenny	9.4	8.3	8.4	7.6	7.0
	Tipperary Sth	5.0	5.3	7.9	9.7	13.9
	Waterford	12.6	16.4	15.0	11.9	11.2
	Wexford	3.2	5.4	4.2	2.8	4.2
HSE S	**Total**	**13.0**	**13.7**	**14.3**	**12.9**	**12.9**
	Kerry	8.1	10.0	11.2	9.6	7.3
	North Cork	13.9	12.6	12.3	10.5	8.4
	North Lee	19.7	20.3	19.6	18.4	21.5
	South Lee	11.2	13.9	15.8	13.4	12.7
	West Cork	8.4	4.4	3.8	6.6	7.9
HSE W	**Total**	**9.1**	**8.1**	**7.8**	**9.5**	**10.0**
	Galway	9.1	6.7	6.5	9.1	10.1
	Mayo	6.8	8.3	8.6	8.2	8.5
	Roscommon	14.4	13.0	11.1	14.1	12.8
Total		**10.0**	**10.2**	**10.3**	**10.3**	**10.6**

† *In some areas, LHO does not always correspond to county*
‡ *Rates cannot be calculated for these LHOs as the population in the LHO is not known*

Geographic origin

Of the 465 patients diagnosed with TB in 2006, 294 (63.2%) were born in Ireland, 161 (34.6%) were born outside Ireland and for the remaining ten cases (2.2%), the country of birth was unknown. The crude TB rate in the indigenous population was 8.3 per 100,000 population while the crude rate in the foreign-born population was 26.3 per 100,000 population.

Figure 7 shows TB cases by geographic origin from 1998 to 2006. Table 11 shows the breakdown of TB cases by HSE area and geographic origin.

Cases born outside Ireland originated from at least 49 countries. Table 12 shows the breakdown of these cases by country of birth and corresponding continent (as specified by EuroTB)[2]. Of the 161 cases born outside Ireland, the exact country of birth was unknown for 10.

Figure 8 shows the age distribution of cases notified in 2006 by geographic origin. The majority (83.2%) of cases born outside Ireland were aged between 15 and 44 years with a median age of 31 years. The median age of those born in Ireland was 45 years with 39.1% of the cases aged greater than 55 years. Figure 9 shows TB cases by age group (years) and age-specific rates by geographic origin during 2006.

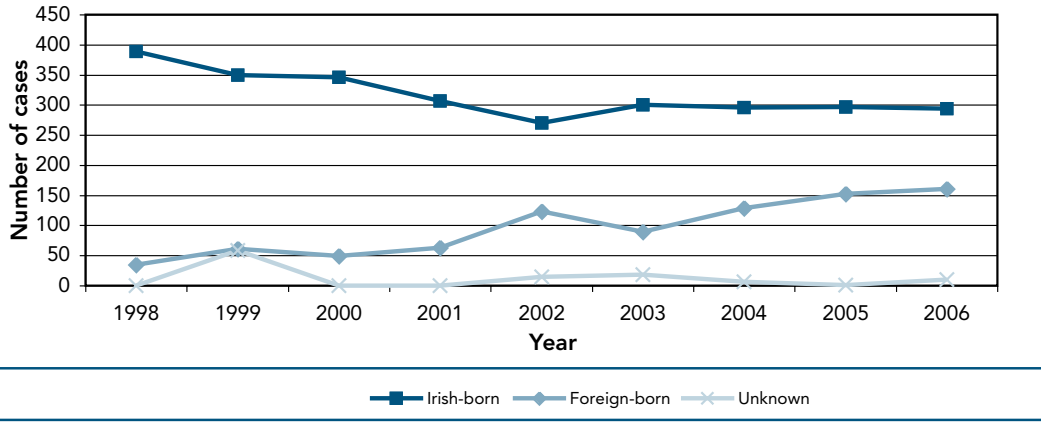

Figure 7: TB cases by geographic origin, 1998 to 2006

Table 11: Cases of TB by HSE area and geographic origin, 2006

HSE area	Irish-born	Foreign-born	Unknown	Total
HSE E	113	80	0	193
HSE M	7	8	0	15
HSE MW	27	10	0	37
HSE NE	24	9	0	33
HSE NW	3	6	0	9
HSE S	71	24	0	95
HSE SE	37	14	0	51
HSE W	12	10	10	32
Ireland	294	161	10	465

Table 12: Countries of origin of foreign-born patients with TB, 2006

Continent	Total	Country	Cases
Africa	58	Algeria	2
		Angola	1
		Botswana	1
		Congo	5
		Eritrea	1
		Ethiopia	2
		Kenya	2
		Libya	1
		Mauritius	1
		Morocco	2
		Nigeria	16
		Somalia	6
		South Africa	7
		Sudan	1
		Zambia	2
		Zimbabwe	8
America	3	USA	1
		Ecuador	1
		Peru	1
Asia	59	Bangladesh	6
		China	1
		Georgia	1
		Hong Kong	1
		India	18
		Iran	1
		Iraq	1
		Lebanon	1
		Malaysia	1
		Mongolia	1
		Nepal	1
		Pakistan	8
		Philippines	9
		Thailand	2
		Vietnam	2
		Unknown	5
Europe	34	Croatia	1
		Estonia	1
		Finland	1
		Serbia	1
		Latvia	1
		Lithuania	4
		Moldova	1
		Poland	9
		Portugal	1
		Romania	5
		UK	8
		Ukraine	1
Oceania	2	Australia	1
		New Zealand	1
Unknown	5		5
Total	**161**		**161**

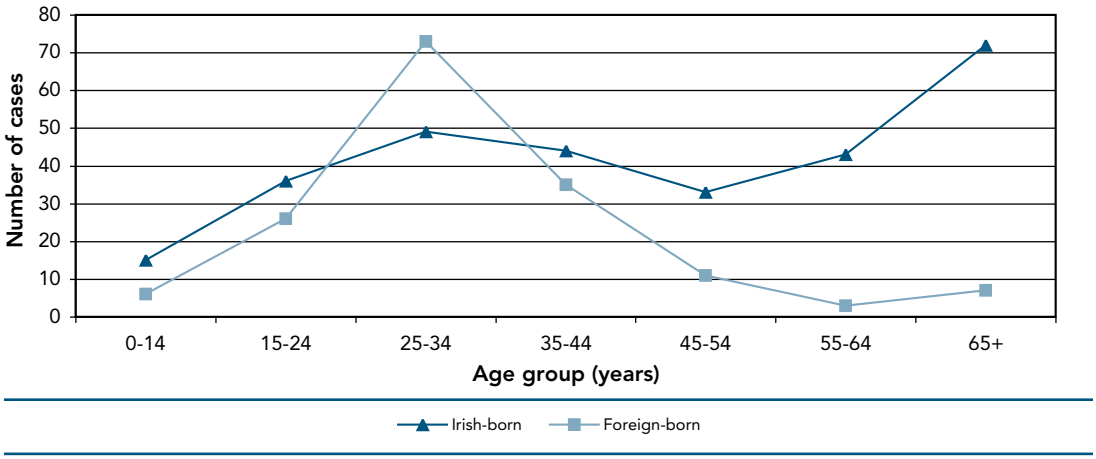

Figure 8: TB cases by age group and geographic origin, 2006

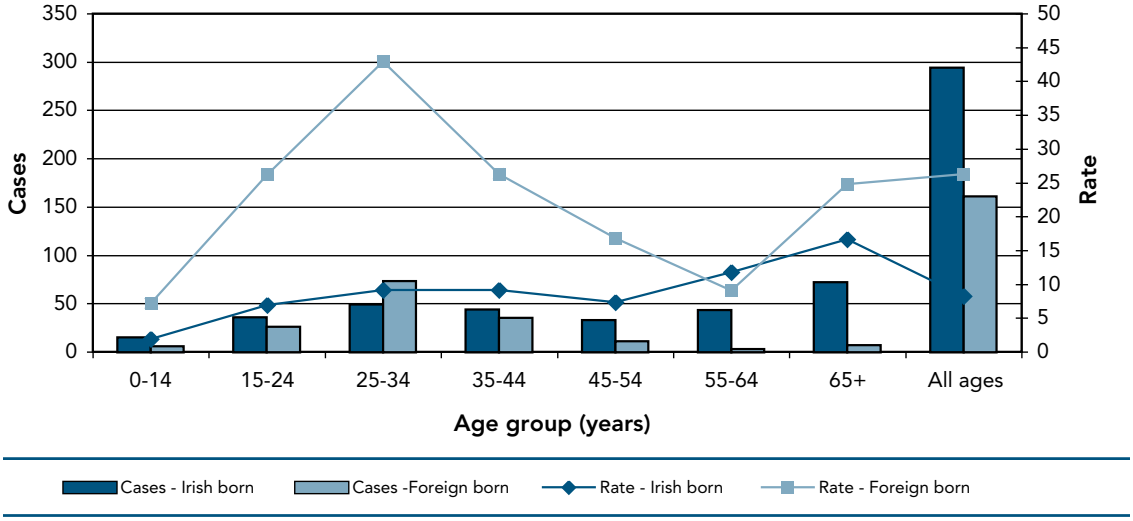

Figure 9: TB cases by age group (years) and age-specific rates by geographic origin, 2006

Site of disease

Of the 465 cases notified in 2006, 299 (64.3%) were pulmonary, 126 (27.1%) were extrapulmonary and 40 (8.6%) were pulmonary and extrapulmonary. TB cases by site of disease and HSE area are shown in table 13.

Table 13: TB cases by site of disease and HSE area, 2006

HSE area	Pulmonary		Extrapulmonary		Pulmonary & extrapulmonary	
	Number	%	Number	%	Number	%
HSE E	122	63.2	48	24.9	23	11.9
HSE M	9	60.0	6	40.0	0	0.0
HSE MW	26	70.3	7	18.9	4	10.8
HSE NE	23	69.7	9	27.3	1	3.0
HSE NW	5	55.6	4	44.4	0	0.0
HSE S	58	61.1	27	28.4	10	10.5
HSE SE	42	82.4	9	17.6	0	0.0
HSE W	14	43.8	16	50.0	2	6.3
Ireland	299	64.3	126	27.1	40	8.6

Pulmonary TB cases

The WHO defines pulmonary TB, for the purpose of analysis, as any case that has a pulmonary disease component. There were 339 cases reported in 2006 with a pulmonary disease component (72.9% of all cases reported). Sputum smear and culture results for these cases are shown in table 14. Sputum microscopy results were available for 251 (74.0%) of the 339 cases. This is a decrease compared to the figures from 2005 (89.0%), 2004 (83.5%), 2003 (82.9%) and 2002 (82.6%). Of the 339 pulmonary cases, 155 (45.7%) were sputum positive for AFB by microscopy and 245 (72.3%) were culture positive.

The proportion of pulmonary cases (with or without an extrapulmonary site) was higher in persons born in Ireland (77.6%) compared to those born abroad (66.5%).

Pulmonary smear positive cases

In Ireland in 2006, 155 (45.7%) of the 339 cases with a pulmonary disease component were smear positive.

Table 14: Sputum smear and culture status for pulmonary TB cases, 2006

Culture result	Sputum smear positive	Sputum smear negative	Sputum smear not done	Sputum smear unknown	Total
Culture positive	140	56	44	5	245
Culture negative	2	29	14	0	45
Culture not done	1	1	16	0	18
Culture unknown	12	10	6	3	31
Total	**155**	**96**	**80**	**8**	**339**

Extrapulmonary TB cases

Extrapulmonary TB was diagnosed in 126 (27.1%) cases of whom 72 (57.1%) were culture confirmed. Forty (31.7%) of the 126 extrapulmonary cases were histology positive, 20 of which were also culture positive and 20 of which were laboratory confirmed by histology only.

One hundred and sixty-six (35.7%) of all cases reported in 2006 had an extrapulmonary disease component. The extrapulmonary sites reported are shown in table 15. The most frequent sites of extrapulmonary disease reported were pleura (27.7%) and extra-thoracic lymph nodes (20.5%).

Table 15: Extrapulmonary disease sites in notified cases, 2006

Site	Number	Percentage
Pleural	46	27.7
Lymph (extra-thoracic)	34	20.5
Other	23	13.9
Genitourinary	13	7.8
Lymph (intra-thoracic)	9	5.4
Spinal	9	5.4
Bone	7	4.2
Disseminated	7	4.2
Meningeal	7	4.2
Peritoneal	5	3.0
CNS	4	2.4
Site not specified	2	1.2
Total	**166**	**100.0**

TB meningitis

There were seven cases of TB meningitis reported in 2006 giving an incidence rate of 0.2 per 100,000 population (2 per million population). A profile of these cases is provided in table 16. Of the seven cases, six were diagnosed as extrapulmonary and one was diagnosed as pulmonary and extrapulmonary. Three cases of TB meningitis were culture confirmed.

Between 1998 and 2006, a total of 57 cases of TB meningitis have been reported, six in 1998, seven in 1999, six in 2000, two in 2001, six in 2002, eight in 2003, six in 2004, nine in 2005 and seven in 2006. The cumulative incidence rates of TB meningitis in each HSE area and in Ireland for 1998-2006 are shown in table 17.

Table 16: TB meningitis cases in Ireland, 2006

HSE area	Age group (years)	History of BCG	Culture status
HSE E	15-24	Yes	Unknown
HSE MW	25-34	Unknown	Positive
HSE NE	25-34	Yes	Unknown
HSE S	0-14	No	Positive
HSE S	65+	No	Negative
HSE W	15-24	Unknown	Positive
HSE W	0-14	No	Unknown
Total	**7 cases**		

Table 17: Cumulative incidence rate of TB meningitis in Ireland, 1998-2006

HSE area	Cases 1998 to 2006	Cumulative incidence rate per 100,000	95% CI
HSE E	19	1.4	0.7 - 2
HSE M	0	0.0	0 - 0
HSE MW	4	1.2	0.0 - 2.3
HSE NE	7	2.0	0.5 - 3.5
HSE NW	2	0.9	-0.3 - 2.2
HSE S	18	3.1	1.7 - 4.5
HSE SE	2	0.5	-0.2 - 1.1
HSE W	5	1.3	0.2 - 2.5
Ireland	57	1.5	1.1 - 1.8

Note: Calculations based on 2002 census figures

Bacteriological results

Of the 465 cases notified in 2006, 357 (76.9%) were laboratory confirmed by culture, microscopy or histology.

Of the 339 cases with a pulmonary component, 265 (78.2%) were laboratory confirmed and of the 126 extrapulmonary cases, 92 (73.0%) were laboratory confirmed by culture, microscopy or histology.

Table 18 shows the breakdown of cases by site of disease and case classification as per EU definition.§

Culture

In 2006, 317 (68.2%) of all TB cases notified were culture positive. This is a marked increase on the proportion reported in 2005 (62.9%), 2004 (64.6%), 2003 (64.4%), 2002 (61.0%) and 2001 (58.8%).

Of the 339 cases with a pulmonary component, 245 (72.3%) were culture confirmed and of the 126 extrapulmonary cases, 72 (57.1%) were culture confirmed.

Table 19 shows a breakdown by culture status and HSE area of TB cases notified in 2006.

*Table 18: Case classification** of TB cases by site of disease, 2006*

Site of disease	Possible	% Possible	Probable	% Probable	Confirmed	% Confirmed
Pulmonary	59	19.7	19	6.4	221	73.9
Pulmonary and extrapulmonary	14	35.0	2	5.0	24	60.0
Extrapulmonary	34	27.0	20	15.9	72	57.1
Total	**107**	**23.01**	**41**	**8.8**	**317**	**68.2**

Table 19: Culture status of TB cases by HSE area, 2006

HSE area	Culture positive	Culture negative	Culture not done	Culture unknown	Total
HSE E	128	25	17	23	193
HSE M	10	5	0	0	15
HSE MW	28	6	2	1	37
HSE NE	16	3	1	13	33
HSE NW	5	2	1	1	9
HSE S	65	21	7	2	95
HSE SE	39	10	2	0	51
HSE W	26	0	0	6	32
Ireland	317	72	30	46	465

§ See page 7 for detailed definition of EU case classification.
** EU Case classification

Species

Among the 317 culture-confirmed cases, information on species was reported for 315 (99.4%) of the cases. Of the 315 culture-confirmed cases where species was reported, 309 (98.1%) were *M. tuberculosis*, five (1.6%) were *M. bovis* and one (0.3%) was *M. africanum*.

Antibiotic resistance

Information on the results of sensitivity testing was reported for 297 (93.7%) of the 317 culture-confirmed cases. Of the 297 cases where sensitivity results were reported, resistance was documented in 27 cases (5.8% of total cases), including four cases of multidrug-resistant TB (MDR-TB) (representing 0.9% of total cases). Mono-resistance to isoniazid was recorded in 14 cases, to rifampicin in two cases, to ethambutol in one case, to pyrazinamide in one case and to streptomycin in four cases. Resistance to isoniazid, ethambutol and streptomycin was also documented in one further case. Nine of the 27 (33.3%) drug resistant cases, including three (75%) of the MDR-TB cases, were born outside Ireland. A profile of resistant cases in 2006 is shown in table 20.

Table 20: Sensitivity results of drug resistant TB cases in Ireland, 2006

Diagnosis	Isolate	Isoniazid	Rifampicin	Pyrazinamide	Ethambutol	Streptomycin
Pulmonary	M.tb	+	+	+	+	
Pulmonary	M.tb	+	+	+	+	+
Extrapulmonary	M.tb	+	+	-	+	+
Pulmonary	M. bovis	+	+		-	-
Pulmonary	M.tb	+	-		-	
Pulmonary	M.tb	+	-	-	+	+
Pulmonary	M.tb	+	-	-	-	
Extrapulmonary	M.tb	+	-	-	-	
Pulmonary	M.tb	+	-	-	-	
Pulmonary	M.tb	+	-	-	-	
Pulmonary	M.tb	+	-	-	-	
Pulmonary	M.tb	+	-	-	-	
Pulmonary	M.tb	+	-	-	-	
Pulmonary	M.tb	+	-	-	-	
Pulmonary	M.tb	+	-	-	-	
Pulmonary	M.tb	+	-	-	-	-
Pulmonary	M.tb	+	-	-	-	-
Pulmonary + Extrapulmonary (P+E)	M.tb	+	-	-	-	-
Pulmonary	M.tb	+	-	-	-	-
Extrapulmonary	M.tb	-	+	-	-	
Pulmonary	M.tb	-	+	-	-	-
Pulmonary	M.tb	-	-		-	+
Pulmonary	M.tb	-	-		-	+
Extrapulmonary	M.tb	-	-	-	+	-
Extrapulmonary	M.tb	-	-	-	-	+
Pulmonary + Extrapulmonary (P+E)	M.tb	-	-	-	-	+
Extrapulmonary	M.tb	-	-	+	-	

(+ indicates resistance)

Treatment outcome

Outcome was recorded for 367 (78.9%) of the 465 cases notified in 2006. Of the 367 cases, 278 completed treatment, 33 were recorded as being lost to follow up, 35 died, treatment was interrupted in

10 cases and 11 cases were still on treatment at time of reporting. Of the 35 deaths reported, 10 (2.2% of total cases) were attributed to TB.

Outcome was reported for 116 (74.8%) of the 155 smear positive cases. Of the 116, 92 completed treatment, six were lost to follow up, treatment was interrupted in two cases, 11 died and five were still on treatment at the time of reporting. Of the 11 deaths among smear positive cases, six were attributed to TB.

Of the 27 drug-resistant cases, 12 completed treatment while four were lost to follow up, two died, three were still on treatment at the time of reporting, treatment was interrupted in one case and treatment outcome was unknown in five cases. Of the four MDR-TB cases, one case completed treatment, one was still on treatment at the time of reporting, treatment was interrupted in one case and outcome was unknown for the remaining case.

Details on treatment outcome for all cases and for smear positive cases only are shown in table 21 while treatment outcome by HSE area is shown in table 22.

Table 21: Treatment outcome for all cases and smear positive cases, 2006

Treatment outcome	Total cases		Smear positive cases	
	Number	%	Number	%
Completed	278	59.8	92	59.4
Lost to follow up	33	7.1	6	3.9
Died (attributed to TB)	10	2.2	6	3.9
Died (not attributed to TB)	25	5.4	5	3.2
Still on treatment	11	2.4	5	3.2
Interrupted (>2mths)	10	2.2	2	1.3
Defaulted	0	0.0	0	0.0
Unknown	98	21.1	39	25.2
Total	**465**	**100**	**155**	**100**

Table 22: Treatment outcome by HSE area, 2006††

HSE area		Outcome known	Outcome unknown	Lost to follow up	Total
HSE E	Number	114	65	14	193
	%	*59.1*	*33.7*	*7.3*	*100*
HSE M	Number	13	0	2	15
	%	*86.7*	*0.0*	*13.3*	*100*
HSE MW	Number	34	2	1	37
	%	*91.9*	*5.4*	*2.7*	*100*
HSE NE	Number	24	8	1	33
	%	*72.7*	*24.2*	*3.0*	*100*
HSE NW	Number	6	0	3	9
	%	*66.7*	*0.0*	*33.3*	*100*
HSE S	Number	47	0	4	51
	%	*92.2*	*0.0*	*7.8*	*100*
HSE SE	Number	84	3	8	95
	%	*88.4*	*3.2*	*8.4*	*100*
HSE W	Number	12	20	0	32
	%	*37.5*	*62.5*	*0.0*	*100*
Total	Number	334	98	33	465
	%	*71.8*	*21.1*	*7.1*	*100*

†† Outcome statistics were incomplete for HSE E for 2006 due to changes in structures and staffing

Case ascertainment

Table 23 summarises the method by which cases notified in 2006 were found.

Table 23: Method of case finding, 2006

Case found by	Total	Percentage
Presenting as case	364	78.3
Contact tracing	43	9.3
Other	21	4.5
Other screening	8	1.7
Immigrant screening	5	1.1
Unknown	24	5.2
Total	465	100.0

Previous history of TB

Forty-four (9.5%) of the 465 cases were reported to have a previous history of TB with previous year of diagnosis provided for 33 cases. The year of diagnosis ranged from 1940 to 2005 with 22 of the 33 cases (66.7%) reported to have had TB in the previous ten years.

HIV Status

Of the 465 cases, 15 were reported as being HIV positive. However, information on HIV status was not provided or was unknown for 418 (89.9%) of the cases notified in 2006.

Discussion

This is the ninth national report produced by HPSC on the epidemiology of TB in Ireland. The report is based on data from the enhanced national TB surveillance system (NTBSS 2000) which became operational in all HSE areas in Ireland in January 2000. This system is based on the minimum dataset required by the TB Surveillance Unit at the European Centre for Disease Prevention and Control (ECDC). European reports are available at www.eurotb.org.

In 2006, 465 cases of TB were notified to HPSC, a national crude incidence rate of 11.0 per 100,000 population. This is slightly higher than the rates reported between 2000 and 2005, which ranged from 9.7 per 100,000 to 10.6 per 100,000 population, but is lower than the crude incidence rates reported between 1991 and 1999, which ranged from 11.5 per 100,000 to 18.2 per 100,0000 population. The overall notification rate in countries of the EU and Western Europe who report to ECDC was 17.4 per 100,000 population in 2006, ranging from 4.4 per 100,000 population in Cyprus and Iceland to 126.9 per 100,000 population in Romania.[2]

Differences in age-standardised TB incidence rates persist between HSE areas with HSE S having the highest rate in 2006 followed by HSE E and HSE SE. HSE NW had the lowest rate in 2006, followed by the HSE M and HSE W. Examining HSE E in greater detail reveals that certain local health offices (LHOs), in particular Dublin South City, Dublin West, Dublin North West and Dublin North Central LHOs, have consistently high rates of TB. According to the 2006 Census, between 25 to 33% of the population in these LHOs belong to social class 6 and 7 (see Appendix 2 for descriptions of social class).[6] Rates greater than 20 per 100,000 population were reported from Dublin North West and Dublin North Central LHOs (HSE E), North Lee (HSE S) and Tipperary South (HSE SE) in 2006. Donegal had the lowest rate in 2006 at 2.7 per 100,000.

The highest age-specific rate in 2006 occurred among those aged 65 years and over (18.0 per 100,000 population). This is a slight decrease compared to the rate observed in this age group between 2001 and 2005. There were 21 cases in children under 15 years of age in 2006, a rate of 2.4 per 100,000 population, a decrease from the rate in 2005 (3.2 per 100,000). Between 2000 and 2004, the age-specific rate among the 25-34 year age group increased from 10.5 to 16.9 per 100,000 population. Although the rate in this age group decreased to 13.0 per 100,000 population in 2005 it has now risen to 17.0 per 100,000 population in 2006.

There was a notable difference in age between those born in Ireland and those born outside Ireland. In cases born in Ireland, there was a peak among those aged greater than 64 years with a median age of 45 years. In cases born outside Ireland, the peak occurred in those aged 25-34 years with a median age of 31 years. There were 73 foreign-born cases out of a total of 123 (59.3%) in the 25-34 year age group in 2006 compared to 62 foreign-born cases out of a total of 94 (66.0%) in 2005 and 73 foreign-born cases out of a total of 122 (59.8%) in 2004. Where available, data from other countries in the EU and Western Europe show similar trends with more than half of indigenous cases accounted for by the 45-64 year age group and those aged greater than 64 years while the highest rates in foreign-born cases were in the 25-34 year age group.[2]

Rates among males were higher than females for all age groups except for those in the 15-24 year age group. In 2006, the rate in females aged 15-24 years was 11.9 per 100,000 population compared to 9.6 in 2005, 7.9 in 2004 and 7.6 in 2003. Approximately 60% of females in this age group were Irish born. The highest rates in males (25.6 per 100,000 population) were among those aged 65 years and over and the

highest rates in females (16.6) were among the 25-34 year age group. The male to female ratio (1.5:1) reported in 2006 was consistent with the rate reported in 2004 and 2005 (1.5:1).

During 2006, 34.6% of TB cases notified were born outside Ireland. This compares to 33.8% in 2005, 30% in 2004, 21.9% in 2003, 30.1% in 2002 and 16.5% in 2001. In 2006, among countries in the EU and Western Europe who reported data to ECDC, 20% of notifications were in foreign-born patients. In the United Kingdom, Belgium and Austria, where crude incidence rates are similar to those reported in Ireland, the percentage of cases of foreign origin in 2006 ranged from 38 to 64%.[2] The crude rate of TB notifications in the indigenous population was 8.3 per 100,000 population which is the same as the rate of 8.3 per 100,000 population in 2005 and very similar to the rate of 8.4 per 100,000 population in 2004. The crude rate in foreign-born cases was 26.3 per 100,000 in 2006, a slight increase from 24.8 per 100,000 in 2005 and a decrease from 32.3 per 100,000 in 2004.

There were seven cases of TB meningitis in 2006, a rate of 0.2 per 100,000 population. Of the seven cases of TB meningitis, two were aged between 0-14 years, two were aged 15-24 years, two were aged 25-34 years and one was aged greater than 64 years. Between 1998 and 2006, five cases of TB meningitis were reported among 0-4 year olds. The Report of the Working Party on Tuberculosis (1996),[7] recommends that the cessation of neonatal BCG vaccination should be considered if certain criteria are met. One of these criteria is that the average annual notification rate of TB meningitis in children under five years of age should be less than one case per ten million general population over the previous five years. Between 2001 and 2006 there were four cases of TB meningitis in children under five years of age, one in 2006, two in 2003 and one in 2002. The criteria for discontinuation of BCG vaccination and how they apply to Ireland are outlined in Appendix 3. All of these criteria are not yet met in full.

In 2006, 317 (68.2%) of all cases of TB notified were culture positive. This is a marked increase compared to the proportion in 2005 (62.9%), 2004 and 2003 (64.6%), 2002 (61.0%) and 2001 (58.8%). One hundred and fifty-five pulmonary cases were smear positive.

There were 27 drug-resistant cases notified in 2006, including four cases of MDR-TB. MDR-TB cases and other cases resistant to isoniazid represented 0.9% (four cases) and 3.0% (14 cases) of total cases respectively. This compares to 0.4% and 2.2% respectively in 2005. In 2006, the proportion of cases with MDR ranged from 0-18.6% in the EU and Western Europe, but was higher in Malta (14.3%, two cases) and the Baltic States (14.8-18.6%). MDR-TB or XDR-TB is more likely in patients previously treated for TB or in immigrants from countries with a high burden of MDR-TB. In Europe, drug resistance was higher in cases of foreign origin compared to nationals. In Ireland in 2006, three out of four MDR-TB cases were born outside Ireland.

Drug resistance is an issue that needs to be kept under close review especially with the emergence of XDR-TB. In October 2006, the World Health Organization (WHO) expressed concern over the emergence of XDR-TB and called on countries to strengthen and implement measures to prevent the global spread of these virulent drug resistant strains of TB. In this context, WHO recommends strengthening of basic TB care and public health infrastructures to prevent the emergence of drug resistance, increased collaboration between HIV and TB control programmes and increased investment in laboratory infrastructure to enable better detection and management of resistant cases of TB. They also recommend strengthening of surveillance and infection control systems and that low-priced, high quality drugs be more readily available.[5]

A recent article in Eurosurveillance on XDR-TB by Kennedy *et al* [8] stated that the threat from XDR-TB could be averted by increased awareness among clinicians and the public of the possibility of TB

disease as a diagnosis, early referral of suspect cases of TB for chest X-ray, sputum staining and culture, appropriate infection control measures and drug susceptibility testing on cases where *Mycobacterium tuberculosis* is cultured. They also stated that if MDR- or XDR-TB is diagnosed, treatment in a specialist centre is advised.

In recent years, the quality of the data, and in particular, data on treatment outcome, has improved greatly. However, information on treatment outcome was provided for only 78.9% of cases in 2006, which is a marked decrease on the proportion in 2005 (87.1%). This compares to 84.3% in 2004, 84.8% in 2003, 77.2% in 2002 and 59.8% in 2001. It is also notable that treatment outcome is unknown for 25% of smear positive pulmonary cases. It is of critical importance to TB control in Ireland that surveillance of TB and reporting of outcome data be maintained at a high level with the global threat of resistant strains. This is especially true for sputum smear positive cases.

The Global Plan to Stop TB 2006-2015 was launched in January 2006 and aims to reduce the global prevalence of, and deaths due to TB by 50% in 2015 relative to 1990. In addition, it proposes to eliminate TB as a public health problem (<1 case per million population) by 2050. This strategy calls on countries to strengthen health systems for TB treatment and control and to address MDR-TB, TB/HIV and other challenges e.g. high risk groups and areas where TB rates are high.[9] The importance of good surveillance data cannot be underestimated in this context as they will help guide where resources should be directed in order to ensure the effective prevention and control of TB in Ireland and in order to reach the elimination target by 2050.

Conclusions

There was a slight increase in TB case notifications in 2006 compared to 2005.

A regional variation was noted in the TB notification rates ranging from 4.0 per 100,000 in HSE NW to 15.3 per 100,000 in HSE S.

Certain local health offices in HSE E (Dublin North West and Dublin North Central) and North Lee in HSE S reported rates greater than 20 per 100,000 population in 2006.

The highest age-specific rate in 2006 occurred among those aged greater than 64 years.

The age-specific rate among 25-34 years olds increased to 17.0 per 100,000 in 2006 from 13.0 per 100,000 in 2005.

Rates were higher in males than females for all age groups except the 15-24 year age group. The highest rates among males were in those aged greater than 64 years and in the 25-34 year age group in females.

In 2006, 34.6% of cases were born outside Ireland compared to 33.8% in 2005, 30.0% in 2004, 21.9% in 2003 and 30.1% in 2002.

There was a notable difference in age between cases born in Ireland (median age 45 years) and cases born outside Ireland (median age 31 years).

In 2006, 339 (72.9%) of the TB cases had a pulmonary disease component of which 245 were culture positive and 155 were smear positive.

There were seven cases of TB meningitis in 2006. Ages ranged between one to 74 years.

Treatment outcome data were provided for 78.9% of cases, a decrease compared to the proportion in 2005. Treatment was completed for 278 (59.8%) of the cases notified in 2006 and there were 35 deaths reported (10 attributable to TB).

There were 27 drug-resistant cases notified in 2006. Of the 27, 19 were resistant to izoniazid, including four MDR-TB cases.

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Appendix 1: TB Cases Notified in Ireland in 2007, Provisional Data[Ψ]

There were 478 cases of TB provisionally notified in 2007. It is important to note that these data are provisional and **may change significantly following validation**.

A summary of the data is shown in table 24.

Table 24: Provisional summary of the epidemiology of TB in Ireland, 2007

Parameter	2007
Total number of cases	478[‡‡]
Crude notification rate per 100,000	11.3
Cases in indigenous population	277
Cases in foreign-born persons	181
Culture positive cases	237
Smear positive pulmonary cases	151
Mono-resistance to isoniazid	3
Multidrug-resistant cases	5
TB meningitis cases	7

Crude incidence rates by HSE area

The total number of TB cases in each HSE area is shown in table 25 with crude incidence rates and 95% confidence intervals included.

Table 25: Provisional TB cases in each HSE area, 2007

HSE area	Cases	Crude rate per 100,000	95% CI for rate
HSE E	210	14.0	12.1 - 15.9
HSE M	16	6.4	3.2 - 9.5
HSE MW	31	8.6	5.6 - 11.6
HSE NE	20	5.1	2.9 - 7.3
HSE NW	16	6.7	3.4 - 10.1
HSE S	108	17.4	14.1 - 20.7
HSE SE	30	6.5	4.2 - 8.8
HSE W	47	11.3	8.1 - 14.6
Ireland	478	11.3	10.3 - 12.3

Age and sex

There were 293 cases (61.3%) of TB notified in males and 183 cases (38.3%) in females, giving a male to female ratio of 1.6:1. Sex was not reported in two cases.

The mean age of cases notified was 40.8 years (range 1 to 94 years).

Ψ 2007 data as of 28th July 2008

‡‡ Please note this includes 20 cases from an outbreak in HSE S

Geographic origin

Of the 478 cases provisionally notified in 2007, 277 (57.9%) were born in Ireland and 181 (37.9%) were foreign-born. Information on country of birth was not reported for 20 cases.

Of the 181 cases born outside Ireland, 50 were born in Africa, 84 in Asia and 36 in Europe. The country of birth was unknown for 11 of the cases born outside Ireland.

Site of disease

Of the 478 cases provisionally notified in 2007, pulmonary TB was diagnosed in 317 cases (66.3%), extrapulmonary TB in 121 cases (25.3%) and pulmonary and extrapulmonary TB in 30 cases (6.3%). The site of disease was unknown for 10 cases (2.1%).

Of the 347 cases with a pulmonary disease component, 186 (53.6%) were culture positive and 151 (43.5%) were smear positive.

TB meningitis

There were seven cases of TB meningitis provisionally notified in 2007 giving an incidence rate of 0.2 per 100,000 population (2 per million population). Three of the cases were in the 35-44 year age group, three were aged 55-64 years and one was greater than 65 years. Three of the cases were reported as having received BCG vaccination, two of whom were also reported as having a scar from BCG vaccination. Of the seven cases, three were culture positive, one case was culture negative and the culture status was not reported for the remaining three.

Culture

Of the 478 cases provisionally notified in 2007, 237 (49.6%) were culture confirmed. Of the 347 with a pulmonary component, 186 (53.6%) were culture positive and of the 121 extrapulmonary cases, 49 (40.5%) were culture positive.

Among the 237 culture positive cases, 216 were *M. tuberculosis*, five were *M. bovis* and two were *M. africanum*. The species was not provided for 14 of the culture positive cases.

Antibiotic resistance

Resistance was reported in 10 cases out of a total of 216 *M. tuberculosis* isolates (4.6%). There were five cases of MDR-TB and three which were mono-resistant to isoniazid. Eight of the 10 resistant cases, including four of the MDR-TB cases, were born outside Ireland.

TB outbreak in HSE South

The most significant outbreak reported in Ireland in recent years was notified by HSE South in March 2007. The outbreak of 21 cases of TB (18 children and 3 adults) involved two crèches. The vast majority of child cases were toddlers (children aged 2 to 3 years).

A symptomatic crèche worker (index case) was diagnosed with sputum positive pulmonary TB in March 2007. This case had worked in two large crèches and worked primarily with toddler children at both locations.

Twenty-nine percent of children in one of the crèches and 19% in the other had evidence of BCG vaccination. None of the 18 child cases had BCG vaccination. The *M. tuberculosis* strain isolated from the index case was reported as pan-sensitive.

Appendix 2: Social Class (Source: CSO)[6]

Social Class

The entire population is classified into one of the following social class groups (introduced in 1996) which are defined on the basis of occupation:

1 Professional workers
2 Managerial and technical
3 Non-manual
4 Skilled manual
5 Semi-skilled
6 Unskilled
7 All others gainfully occupied and unknown

The occupations included in each of these groups have been selected in such a way as to bring together, as far as possible, people with similar levels of occupational skill. In determining social class no account is taken of the differences between individuals on the basis of other characteristics such as education. Accordingly social class ranks occupations by the level of skill required on a social class scale ranging from one (highest) to seven (lowest). This scale combines occupations into six groups by occupation and employment status following procedures similar to those outlined above for the allocation of socio-economic group. A residual category "All others gainfully occupied and unknown" is used where no precise allocation is possible.

Appendix 3: BCG Vaccination

The Report of the Working Party on Tuberculosis (1996),[7] based on the recommendations of the International Union Against Tuberculosis and Lung Disease (IUATLD),[10] recommends that the cessation of neonatal BCG vaccination should be considered if certain criteria are met.

Criterion 1
There is a well functioning tuberculosis control programme.

Ireland: The tuberculosis control programme is currently being reviewed and it is likely that recommendations will be made for strengthening the programme.

Criterion 2
There has been a reliable reporting system over the previous five or more years, enabling the estimation of the annual incidence of active tuberculosis by age and risk groups, with particular emphasis on tuberculosis meningitis and sputum smear positive pulmonary tuberculosis.

Ireland: Yes. National data enabling a detailed epidemiological analysis for the country as a whole were first presented by HPSC in the 1998 National TB Report. The 2006 report is the ninth national TB report produced by HPSC.

Criterion 3
Due consideration has been given to the possibility of an increase in the incidence of tuberculosis resulting from the epidemiological situation of AIDS in that country.

Ireland: Yes

Criterion 4
The average annual notification rate of sputum smear positive pulmonary tuberculosis should be 5 per 100,000 population or less during the previous three years.

Ireland: Yes. In 2006, the national rate for sputum smear positive pulmonary TB was 3.7 per 100,000 population while in 2005, 2004, 2003 and 2002, the rates were 3.3, 3.5, 3.7 and 3.1 per 100,000 population respectively.

Criterion 5
The average annual notification rate of TB meningitis in children under five years of age should be less than one case per ten million general population over the previous five years.

Ireland: No. Between 2001 and 2006, there were four cases of TB meningitis in children under five years of age, one in 2006, two in 2003 and one in 2002. Of the four cases, one child had received BCG vaccination and the other three had not. Two of the four cases were culture confirmed.

Criterion 6

The average annual risk of tuberculosis infection should be 0.1% or less.

Ireland: Not applicable.

When considering the importance of neonatal BCG vaccination, it is worth considering the practice in other European countries. For example, Sweden discontinued routine neonatal BCG vaccination in 1975 when they had a total notification rate of 20 per 100,000 population and an age-specific incidence rate for children aged 0-14 years of 0.3 per 100,000. While the national crude rate in Ireland is less than 20.0 per 100,000 population, the 2006 age-specific incidence rate for children 0-14 years was 2.4 per 100,000, 8 times the rate recorded in Sweden when they discontinued neonatal BCG vaccination. In 2005, 2004, 2003, 2002, 2001 and 2000, the age-specific incidence rate for children aged 0-14 years was 3.0, 1.2, 2.9, 2.2, 1.9, and 1.9 per 100,000 population respectively. In 1999, the age-specific incidence rate for children aged 0-14 years was 4.7 per 100,000 population, almost sixteen times the rate recorded in Sweden.

In summary, Ireland does not yet meet all of the criteria (outlined above), for discontinuation of the national BCG vaccination programme.

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