Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

hpsc

Epidemiology of Tuberculosis in Ireland 2008

A Report by the
Health Protection Surveillance Centre

March 2011

Table of Contents

Acknowledgements

Sincere thanks are extended to all those who participated in the collection of data used in this report. This includes the notifying physicians, public health doctors, surveillance scientists, microbiologists, nurses, laboratory staff and administrative staff.

Report prepared by Lorraine Hickey, Sarah Jackson, Kate O'Donnell, Joan O'Donnell, Darina O'Flanagan, HPSC.

Summary

- There was a slight decrease in TB case notifications in 2008 (n=468) compared to 2007 (n=480).
- A regional variation was noted in TB notification rates (per 100,000) ranging from 4.6 in HSE North East to 15.8 in HSE East.
- Certain local health offices in HSE East (Dublin South City, Dublin West, Dublin North Central) and HSE South (North Lee) reported rates greater than 20 per 100,000 population in 2008.
- The highest age-specific rate in 2008 occurred among those aged 25-34 years (19.0/100,000).
- The age-specific rate (per 100,000) among 25-34 years olds increased to 19.0/100,000 in 2008 from 17.9 in 2007 and 16.6 in 2006.
- Rates were higher in males than females for all age groups except for the 0-14 year age group. The highest rates among males were in those aged over 64 years and among females in those aged 25-34 years.
- In 2008, 43.6% of cases were born outside Ireland compared to 40.0% in 2007 and 34.6% in 2006.
- There was a notable difference in age between cases born in Ireland (median age 52 years) and cases born outside Ireland (median age 29 years).
- In 2008, 336 (71.8%) of the TB cases had a pulmonary disease component of which 244 (72.6%) were culture positive and 158 (47.0%) were smear positive.
- There were six cases of TB meningitis notified in 2008 (age range: 10 to 85 years).
- Treatment outcome data were provided for 88.5% of cases. Treatment was completed for 338 (72.2%) of all cases and for 120 (75.9%) smear positive cases notified in 2008.
- There were 36 deaths reported (9 attributable to TB).
- There were 27 drug-resistant cases notified in 2008, including two MDR-TB cases. There were no cases of XDR-TB reported in 2008.
- There were 472 cases of TB provisionally notified in 2009.

Introduction

The World Health Organization (WHO) has estimated that globally there were 9.4 million new cases of tuberculosis (TB) in 2008 (139 per 100,000 population). Of these, 4.3 million (46%) were new smear positive cases. Approximately 1.3 million TB deaths occurred globally in 2008.[1]

In 2008, 461,645 cases of TB were reported by 50 of the 54 countries of the WHO European Region (plus Liechtenstein). The overall notification rate averaged 52.2 cases per 100,000, with a wide variation between countries and an incremental west-to-east gradient.[2] Figure 1 displays a map of TB notification rates in the WHO European region.

The lowest rate in the region occurred in Western Europe [EU countries (excluding Austria – no data available) plus Iceland, Norway and Switzerland] at 16.7 per 100,000 population, with rates lower than 10 per 100,000 reported in 14 countries and higher than 20 per 100,000 in Romania (115.1), the Baltic States – Lithuania (66.8), Latvia (47.1) and Estonia (33.1), - Bulgaria (41.2), Portugal (28.7) and Poland (21.2). In 2008, 22.4% of reported TB cases in Western Europe were of foreign origin. This proportion ranged from 21.3% to 88.0% across 17 countries. Multi-drug resistance remained most frequent in the Baltic States (combined MDR: 15.6%-21.3%) followed by Romania (14.7%). Other countries reported lower levels of MDR (0-5%) where it is generally more common in foreign-born cases.

The seven Balkan countries in Central Europe (Albania, Bosnia and Herzegovina, Croatia, F.Y.R. of Macedonia, Montenegro, Serbia and Turkey) reported 24,013 cases of TB in 2008, corresponding to an overall notification rate of 26.1 per 100,000 population. In 2008, Turkey accounted for 76.8% of the 24,013 cases reported from this region.

In 2008, 354,132 cases were reported from the 12 non-EU eastern European and central Asian countries of which 60.7% were from the Russian Federation. The highest burden of MDR-TB cases in the European region is in this area where the prevalence is 13.5% in newly diagnosed cases, five times higher than the prevalence reported in the EU/EEA countries.

Overall, the proportion of cases with multidrug-resistant TB (MDR-TB) across the entire European region was 11.1% a significant increase on the previous year (4.0% in 2007). The increase was attributed to improvements in drug susceptibility testing (DST).

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 the new

guidelines for TB prevention and control in Ireland were published in April 2010.

This report presents an epidemiological review of all TB cases notified in 2008. Data for 2008 have been validated and updated to include information relating to treatment outcome. Provisional data for 2009 are presented in Appendix 1.

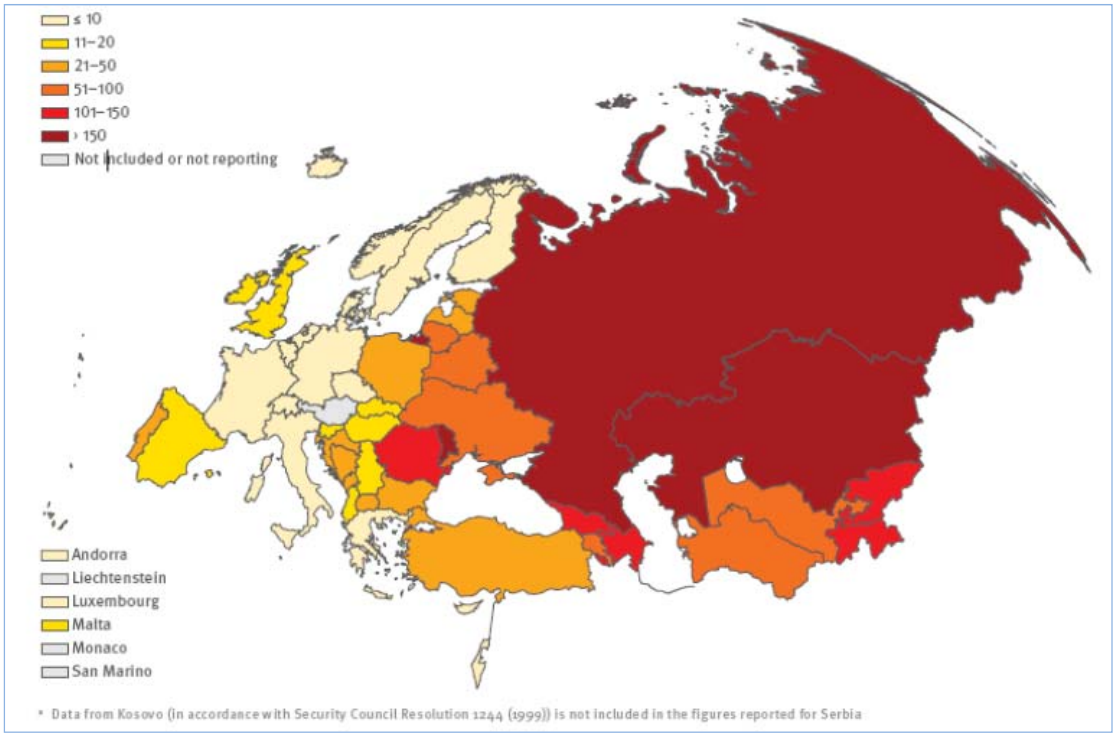

Figure 1: Tuberculosis notification rates per 100,000 population, WHO European region, 2008[2]

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

Confirmed case – A person meeting the clinical criteria with either:

- 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

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

Possible case: A person meeting the clinical criteria without laboratory confirmation

Pulmonary TB: TB of the lung parenchyma or the tracheo-bronchial tree or the larynx. The WHO defines pulmonary TB, for the purpose of analysis, as any case that has a pulmonary disease component.

Extra-pulmonary TB: TB affecting any site other than pulmonary as defined above. Pleural TB and intra-thoracic lymphatic TB by themselves are considered as extrapulmonary.

Pulmonary and extra-pulmonary TB is a case of TB that meets the previous two definitions

Smear positive case[4]**:** 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 2008 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 2008. 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 2008 data with outcome information to HPSC between March and November 2010. Data were validated with each area and national data were collated. Provisional 2009 data were obtained from each area in June 2010.

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, 2007, 2008 and 2009 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 2008 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, 2008

Overall cases and rates

There were 468 cases of TB notified in 2008, a rate of 11.0 per 100,000 population. A summary of the 2008 data is shown in table 1.

Table 1: Summary of the epidemiology of TB in Ireland, 2008

Parameter	Number (% of total)
Total number of cases	468
Crude notification rate per 100,000	11.0
Cases in indigenous population*	263 (56.2%)
Rate in indigenous population per 100,000	7.4
Cases in foreign-born persons	204 (43.6%)
Rate in foreign-born persons per 100,000	33.3
Culture positive cases	312 (66.7%)
Pulmonary cases	336 (71.8%)
Of which sputum smear positive	158 (47.0%)
Resistant cases	27 (5.8%)
Multi-drug resistant cases	2 (0.4%)
Deaths attributable to TB	9 (1.9%)
Outcomes reported in all cases	414 (88.5%)
Outcomes reported in sputum smear positive cases	144 (91.0%)
TB meningitis cases	6 (1.3%)

* Country of birth unavailable for 1 case

The number and rates of TB cases notified for each of the years from 1992-2008 are shown in table 2. Three-year moving averages for the years 1992-2007 are also shown.

Table 2: Number and rates of notified cases of TB in Ireland, 1992-2008 with 3-year moving averages, 1992-2007

Year	Number of cases	Crude rate per 100,000 population	3-year moving average
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	413
2004	431	10.2	430
2005	450	10.6	449
2006	465	11.0	465
2007	480	11.3	472
2008	468	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 East at 15.8 per 100,000 population which was significantly higher than the national rate. Rates in HSE North East (4.6), HSE North West (5.9) and HSE South East (6.5) were significantly lower than the national rate.

The crude incidence rates seen in each HSE area from 1992 to 2008 are shown in table 4 while the 3-year moving average TB notification rates for each HSE area from 1992 to 2007 are shown in table 5.

Table 3: Notified TB cases by HSE area, 2008

HSE area	Number of cases	Crude rate per 100,000	95% CI for rate
HSE-E	237	15.8	13.8-17.8
HSE-M	24	9.5	5.7-13.4
HSE-MW	26	7.2	4.4-10.0
HSE-NE	18	4.6	2.5-6.7
HSE-NW	14	5.9	2.8-9.0
HSE-S	88	14.2	11.2-17.1
HSE-SE	30	6.5	4.2-8.8
HSE-W	31	7.5	4.8-10.1
Ireland	**468**	**11.0**	**10.0 - 12.0**

Table 4: Crude TB incidence rates per 100,000 population by HSE area, 1992-2008

Year	HSE-E	HSE-M	HSE-MW	HSE-NE	HSE-NW	HSE-S	HSE-SE	HSE-W	Total
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
2007	14.6	6.4	8.0	6.1	7.2	16.4	6.3	10.6	11.3
2008	15.8	9.5	7.2	4.6	5.9	14.2	6.5	7.5	11.0

Table 5: 3-year moving average TB notification rate per 100,000 population by HSE area, 1992-2007

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	9.4	10.3
2005	12.9	5.6	12.9	5.2	5.8	12.9	8.6	10.0	10.6
2006	13.3	6.2	10.8	6.5	5.3	14.8	9.1	9.2	11.0
2007	14.5	7.1	8.4	6.3	6.0	15.6	7.5	9.1	11.2

Age and sex distribution

There were 281 (60.0%) cases of TB notified in males in 2008 and 187 (40.0%) 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.

Table 6: TB cases by HSE area and sex, 2008

HSE area	Male	Female	Male:Female ratio	Total
HSE-E	143	94	1.5	237
HSE-M	12	12	1.0	24
HSE-MW	15	11	1.4	26
HSE-NE	11	7	1.6	18
HSE-NW	9	5	1.8	14
HSE-S	51	37	1.4	88
HSE-SE	20	10	2.0	30
HSE-W	20	11	1.8	31
Total	**281**	**187**	**1.5**	**468**

In 2008, the median age of cases was 37 years (range: 0-93 years). The median age for Irish-born cases was 52 years and 29 years for foreign-born cases. One hundred and thirty seven cases (29.3%) were aged between 25 and 34 years.

Table 7 shows the number of cases and the age-specific rates for males and females in 2008. Rates in males were higher than females in all age groups except in the 0-14 age group (F 2.4 vs. M 1.1). The highest rate among females was in the 25-34 year age group (18.8) and the highest rate among males was in the over 65 year age group (24.6). Figure 2 shows the cases by age and sex and the male and female age-specific rates in Ireland for 2008. Figure 3 shows the age-specific rates of TB in Ireland from 2000 to 2008

Table 7: TB cases and age-specific rates per 100,000 population for males and females, 2008

Age Group (years)	Female		Male		Total	
	Cases	Rate	Cases	Rate	Cases	Rate
0-14	10	2.4	5	1.1	15	1.7
15-24	30	9.6	30	9.3	60	9.5
25-34	67	18.8	70	19.1	137	19.0
35-44	23	7.5	47	14.9	70	11.2
45-54	16	6.2	47	17.9	63	12.1
55-64	9	4.5	31	15.1	40	9.8
65+	32	12.3	51	24.6	83	17.7
Total	**187**	**8.8**	**281**	**13.2**	**468**	**11.0**

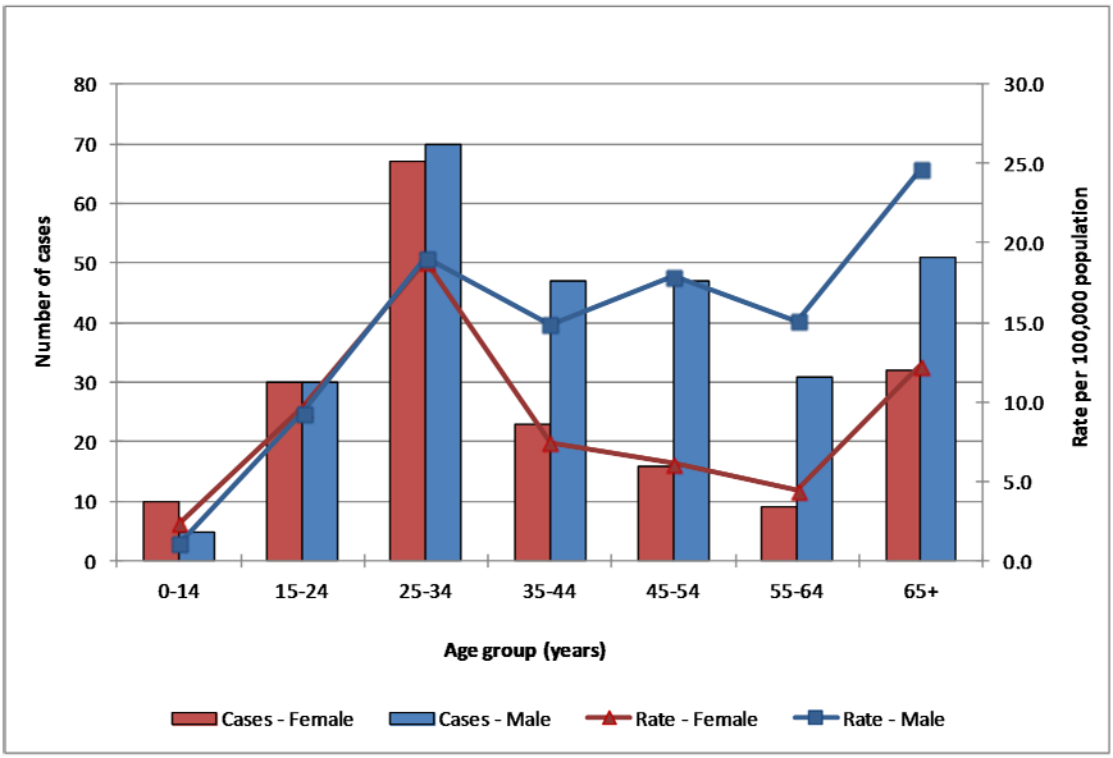

Figure 2: TB cases by age and sex, and age-specific rates per 100,000 population, 2008

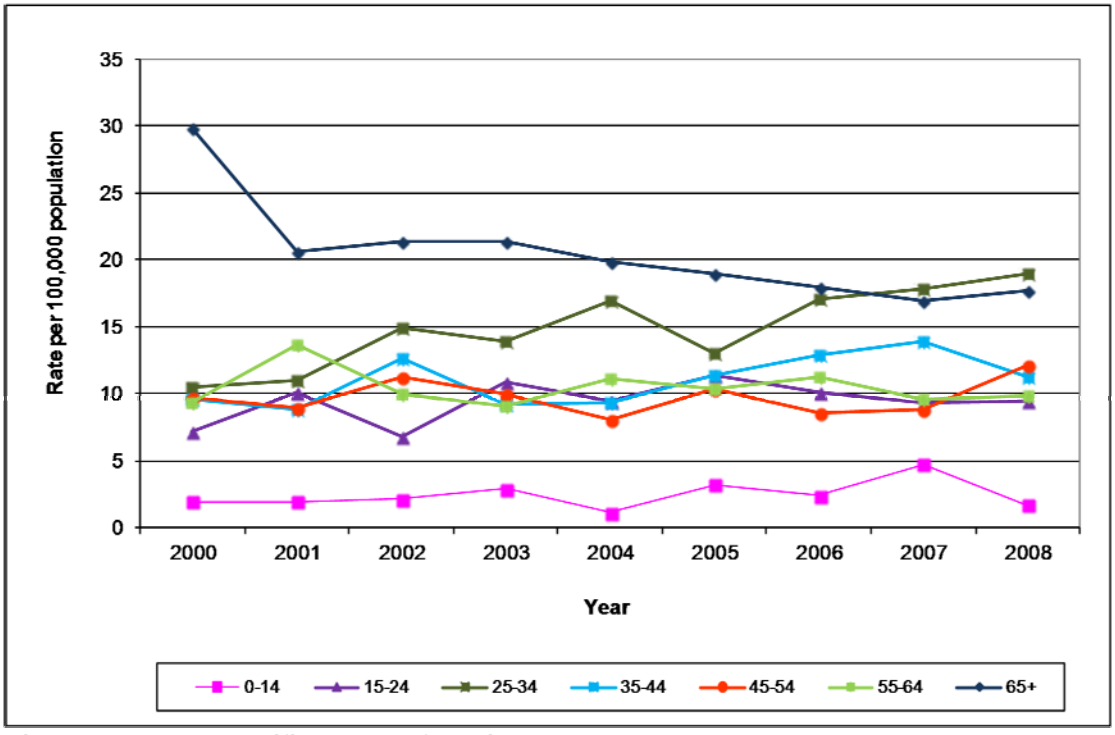

Figure 3: Age-specific rates of TB by year, 2000-2008

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 (per 100,000 population) were seen in HSE East (15.3), HSE South (14.0) and HSE Midland (10.0). while the lowest rates were reported by HSE South East, HSE North West and HSE North East at 6.6, 6.0 and 4.7 per 100,000 population respectively. These rates were significantly lower than the national rate (11.1).

Age-standardised incidence rates for each county for 2008 are shown in table 8 and figure 6 (95% confidence intervals are included in table 8). The highest rates (per 100,000 population) were reported from Dublin (16.8), Cork (16.2), Longford (15.4) and Westmeath (14.4). The lowest rates (per 100,000) were in Kilkenny (2.2), Meath (2.6) and Offaly (3.0).

Crude incidence rates for each local health office (LHO)[†] in 2008 are shown in table 9. Three-year moving averages for the crude incidence rates are presented in table 10. In 2008, the highest crude rates (per 100,000 population) were in Dublin South City (29.8), Dublin West (28.4), Dublin North Central LHO (24.5) and Dublin North West LHO (21.5) in HSE East and Cork North Lee (22.1) in HSE South.

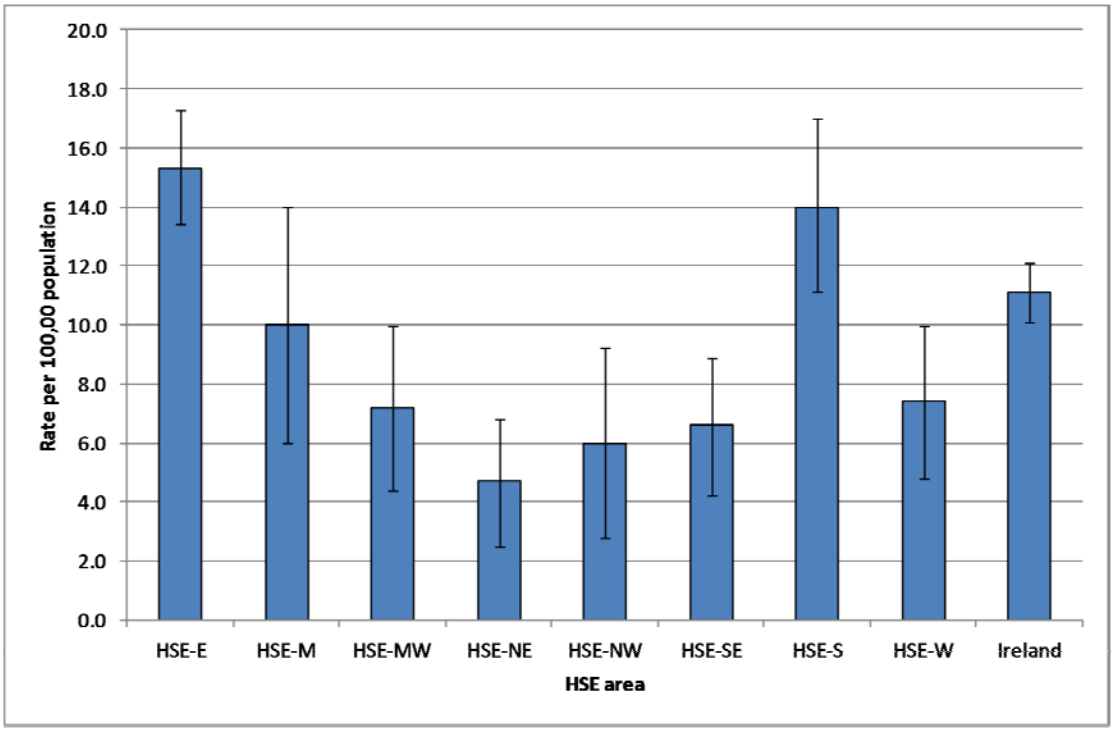

Figure 4: Age-standardised TB incidence rates per 100,000 population by HSE area with 95% confidence intervals, 2008

[†] Note: Local Health Offices (LHOs) came into operation on 1st September 2005, taking over operations from Community Care Areas (CCAs)

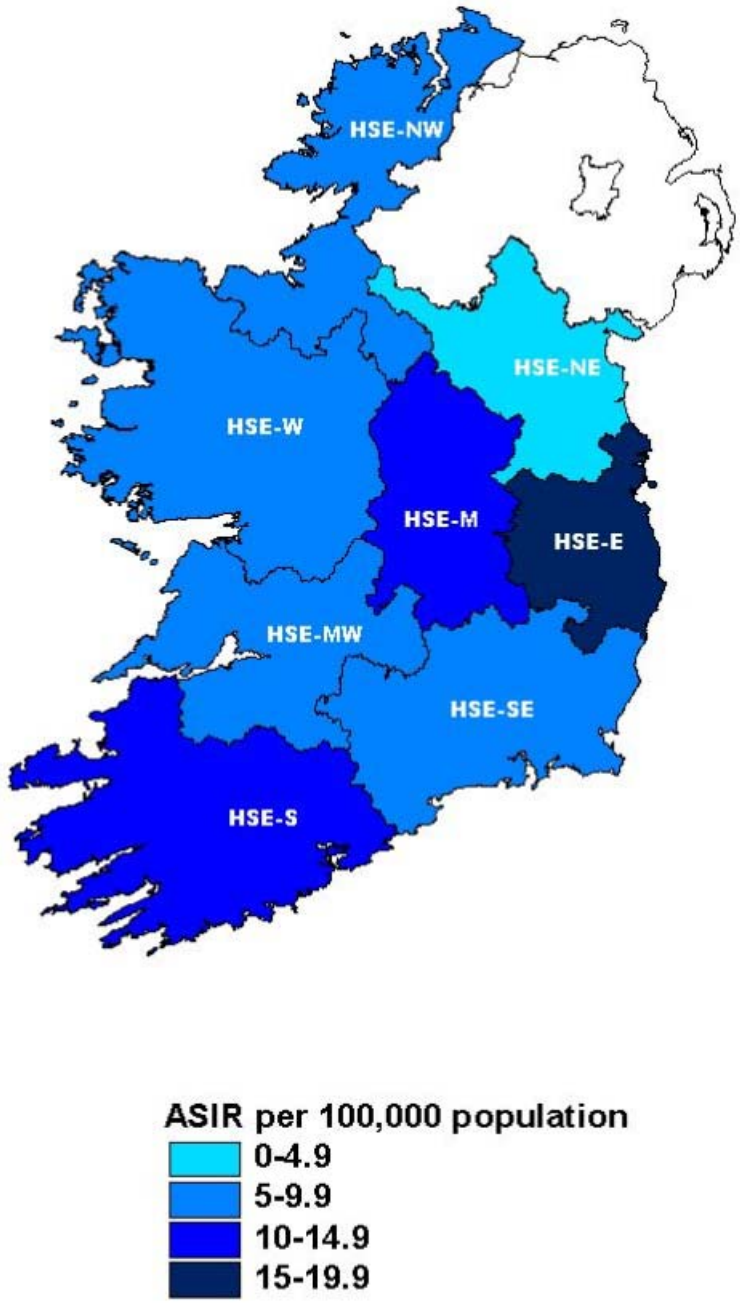

Figure 5: Age-standardised TB incidence rates per 100,000 population by HSE area, 2008

Table 8: Age-standardised TB incidence rates (per 100,000 population) by county with 95% confidence intervals, 2008

County	ASIR	95% CI
Dublin	16.8	14.5-19.1
Cork	16.2	12.6-19.7
Longford	15.4	1.8-28.9
Westmeath	14.4	5.9-22.9
Kildare	13.2	7.8-18.5
Monaghan	10.6	2.1-19.2
Sligo	10.1	2.0-18.2
Waterford	10.0	4.1-16.0
Limerick	9.8	5.3-14.4
Laois	9.5	1.9-17.0
Roscommon	9.0	1.0-16.9
Carlow	8.0	0.2-15.9
Galway	7.9	4.2-11.5
Tipperary	6.5	2.4-10.5
Kerry	6.2	2.3-10.1
Mayo	5.8	1.7-10.0
Wexford	5.3	1.4-9.3
Donegal	4.7	1.2-8.3
Louth	4.5	0.6-8.5
Cavan	4.3	-0.6-9.2
Leitrim	4.3	-4.2-12.8
Wicklow	4.0	0.5-7.5
Clare	3.6	0.1-7.1
Offaly	3.0	-1.2-7.1
Meath	2.6	0.0-5.2
Kilkenny	2.2	-0.9-5.3
Ireland	**11.0**	**10.0-12.0**

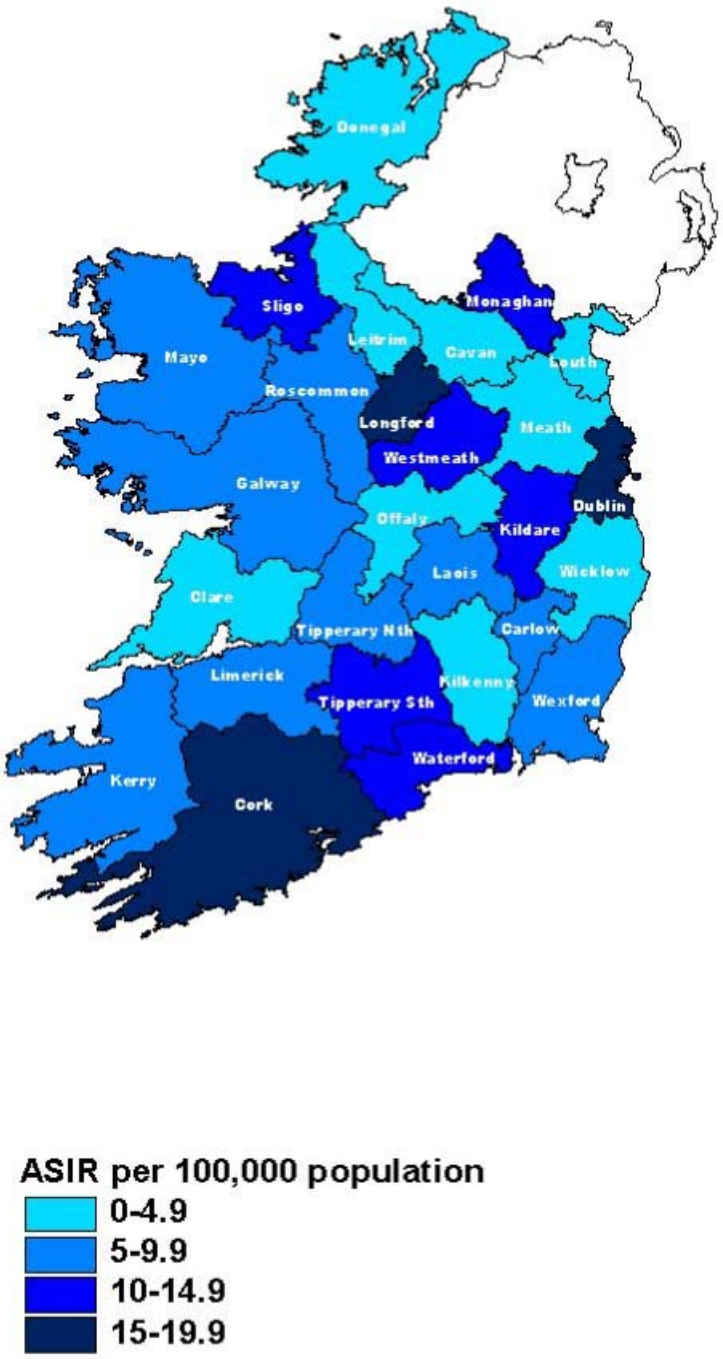

Figure 6: Age-standardised TB incidence rates per 100,000 population by county, 2008

Table 9: TB Crude incidence rate per 100,000 population by local health office (LHO), 2001 to 2008

HSE area	LHO	Rate per 100,000 population							
		2001	2002	2003	2004	2005	2006	2007	2008
HSE-E	**Total**	**12.3**	**11.6**	**11.9**	**12.6**	**13.0**	**12.9**	**14.6**	**15.8**
	Dun Laoghaire	2.3	4.7	4.7	9.5	4.0	5.5	8.7	4.7
	Dublin South East	5.7	7.6	7.6	10.9	7.2	5.4	10.0	15.4
	Dublin South City	26.1	21.5	23.0	23.1	20.1	19.4	29.8	29.8
	Dublin South West	8.2	7.5	10.3	8.1	12.2	5.4	14.9	6.8
	Dublin West	10.3	18.3	19.1	20.1	18.7	17.9	16.4	28.4
	Dublin North West	18.7	23.0	17.4	12.9	19.4	21.0	24.7	21.5
	Dublin North Central	27.8	18.8	21.2	25.3	24.5	26.9	23.7	24.5
	Dublin North	11.8	5.4	4.9	11.3	10.4	11.7	8.6	9.5
	Kildare/West Wicklow	5.0	7.8	8.4	5.4	7.9	6.9	7.4	14.3
	Wicklow	8.0	1.0	5.0	2.7	5.5	8.2	2.7	4.6
HSE-M	**Total**	**3.1**	**8.4**	**5.3**	**3.6**	**6.4**	**6.0**	**6.4**	**9.5**
	LD/WH	6.8	7.8	7.8	4.4	8.8	5.3	6.2	14.1
	LS/OY	0.0	9.0	3.3	2.9	4.4	6.5	6.5	5.8
HSE-MW	**Total**	**7.1**	**9.4**	**12.4**	**12.2**	**14.7**	**10.2**	**8.0**	**7.2**
	Clare	5.8	9.7	6.8	10.8	19.8	8.1	7.2	3.6
	Limerick	na	na	na	na	na	na	na	11.9
	Tipp Nth/East Limerick	na	na	na	na	na	na	na	4.0
HSE-NE	**Total**	**11.0**	**7.0**	**7.5**	**5.8**	**3.3**	**8.4**	**6.1**	**4.6**
	Cavan/Monaghan	16.7	6.3	10.4	5.1	6.7	8.4	5.1	6.7
	Louth/Sth Monaghan	8.8	10.5	9.6	8.1	1.8	7.2	8.1	5.4
	Meath	9.0	4.5	3.7	4.9	1.8	9.2	5.5	2.5
HSE-NW	**Total**	**5.9**	**5.4**	**4.1**	**6.7**	**6.3**	**3.8**	**7.2**	**5.9**
	Donegal	3.6	4.4	2.9	6.8	4.1	2.7	6.8	4.8
	Sligo/Leitrim	9.4	7.0	5.9	6.6	9.9	5.5	7.7	7.7
HSE-S	**Total**	**12.4**	**13.3**	**16.0**	**11.8**	**12.2**	**15.3**	**16.4**	**14.2**
	Kerry	6.8	10.6	12.1	10.0	6.4	6.4	6.4	7.2
	North Cork	9.5	15.0	10.9	12.4	6.2	8.7	7.4	9.9
	North Lee	21.8	18.6	22.4	14.9	21.5	28.0	19.7	22.1
	South Lee	10.7	12.5	19.7	11.2	11.7	16.2	30.1	15.6
	West Cork	7.9	3.9	2.0	7.5	9.3	5.6	0.0	9.3
HSE-SE	**Total**	**4.7**	**11.6**	**8.3**	**7.4**	**8.0**	**11.1**	**6.3**	**6.5**
	Carlow/Kilkenny	8.1	10.8	9.0	7.5	6.6	7.5	5.8	5.0
	Tipperary South	2.4	4.7	9.5	7.9	13.6	20.4	9.0	6.8
	Waterford	7.2	23.3	11.7	13.3	9.2	13.3	8.3	9.2
	Wexford	0.9	6.0	3.4	1.5	4.6	6.1	3.0	5.3
HSE-W	**Total**	**8.9**	**8.7**	**6.0**	**10.6**	**10.9**	**7.7**	**10.6**	**7.5**
	Galway	10.0	5.7	5.3	9.5	11.2	8.2	13.4	7.8
	Mayo	4.3	9.4	8.5	7.3	9.7	7.3	4.8	6.5
	Roscommon	14.9	18.6	3.7	20.4	11.9	6.8	11.9	8.5
Ireland		**9.7**	**10.4**	**10.4**	**10.2**	**10.6**	**11.0**	**11.3**	**11.0**

Table 10: TB 3 year moving average rates (per 100,000 population) by local health office[‡], 2002 to 2007

HSE area	LHO	2002	2003	2004	2005	2006	2007
HSE-E	**Total**	**11.8**	**12.0**	**12.5**	**12.9**	**13.3**	**14.5**
	Dun Laoghaire	4.1	5.9	6.9	5.7	5.9	6.9
	Dublin South East	7.1	8.4	9.1	7.7	7.0	10.2
	Dublin South City	23.0	22.6	22.3	20.7	22.1	27.2
	Dublin South West	8.4	9.1	9.7	9.5	9.5	10.5
	Dublin West	16.5	19.2	19.5	18.8	17.7	19.8
	Dublin North West	20.6	17.7	15.7	18.2	21.5	23.0
	Dublin North Central	21.6	21.6	24.1	25.3	25.5	24.7
	Dublin North	6.9	6.6	9.4	10.9	10.6	9.6
	Kildare/West Wicklow	7.3	7.5	6.8	7.0	7.3	9.0
	Wicklow	3.8	3.4	4.0	5.5	6.2	4.6
HSE-M	**Total**	**6.3**	**5.7**	**4.7**	**5.6**	**6.2**	**7.1**
	Longford/Westmeath	7.5	6.9	6.3	6.8	6.4	7.9
	Laois/Offaly	5.3	4.6	3.4	4.5	6.0	6.3
HSE-MW	**Total**	**9.6**	**11.6**	**12.9**	**12.9**	**10.8**	**8.4**
	Clare[§]	8.0	8.5	12.1	14.6	10.8	6.5
	Limerick[‡]	na	na	na	na	na	na
	Tipperary North/East Limerick[‡]	na	na	na	na	na	na
HSE-NE	**Total**	**8.1**	**7.0**	**5.6**	**5.2**	**6.5**	**6.3**
	Cavan/Monaghan	9.9	8.0	6.8	6.7	7.2	6.3
	Louth/Sth Monaghan	9.9	9.5	6.9	4.7	6.1	7.2
	Meath	5.4	4.2	3.8	4.5	6.4	5.7
HSE-NW	**Total**	**5.2**	**5.1**	**6.0**	**5.8**	**5.3**	**6.0**
	Donegal	3.8	4.2	5.1	4.4	4.1	5.3
	Sligo/Leitrim	7.3	6.3	7.2	8.0	7.1	7.1
HSE-S	**Total**	**13.7**	**14.3**	**12.9**	**12.9**	**14.8**	**15.6**
	Kerry	10.0	11.2	9.6	7.3	6.4	6.6
	North Cork	12.6	12.3	10.5	8.4	7.7	8.4
	North Lee	20.3	19.6	18.4	21.5	24.3	22.4
	South Lee	13.9	15.8	13.4	12.7	18.5	23.0
	West Cork	4.4	3.8	6.6	7.9	5.1	3.7
HSE-SE	**Total**	**9.0**	**8.9**	**7.8**	**8.6**	**9.1**	**7.5**
	Carlow/Kilkenny	9.7	9.1	7.6	7.0	6.8	6.0
	Tipperary South	5.3	7.9	9.7	13.9	15.8	11.3
	Waterford	16.4	15.0	11.9	11.2	11.0	9.8
	Wexford	4.1	3.6	2.8	4.2	4.9	4.4
HSE-W	**Total**	**8.1**	**7.8**	**9.4**	**10.0**	**9.2**	**9.1**
	Galway	6.7	6.4	8.9	10.0	10.3	10.7
	Mayo	7.9	8.4	8.2	8.5	7.3	5.9
	Roscommon	13.9	11.6	14.1	12.8	9.4	9.8
Total		**10.2**	**10.3**	**10.3**	**10.6**	**11.0**	**11.2**

[‡] In some areas, LHO does not always correspond to county

[§] Rates cannot be calculated for these LHO's as the population in the LHO is not known

Geographic origin

Of the 468 patients diagnosed with TB in 2008, 263 (56.2%) were born in Ireland, 204 (43.6%) were born outside Ireland and for the remaining one case (0.2%), the country of birth was unknown. The crude TB rate in the indigenous population was 7.4 per 100,000 population while the crude rate in the foreign-born population was 33.3 per 100,000 population.

Figure 7 shows TB cases by geographic origin from 1998 to 2008.

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. Of the 204 cases born outside Ireland, 51.5% were born in Asia, 27.9% were born in Africa, 17.2% were born in Europe and 2.0% in America. The exact country of birth was unknown for 3 cases (1.5%).

Figure 8 shows age-specific rates by geographic origin during 2008. The majority (86.3%) of cases born outside Ireland were aged between 15 and 44 years compared to 34.6% of Irish cases in this age range. The median age among foreign born cases was 29 years (range: 1-90 years) compared to a median age of 52 years (range: 0-93 years) among Irish born cases.

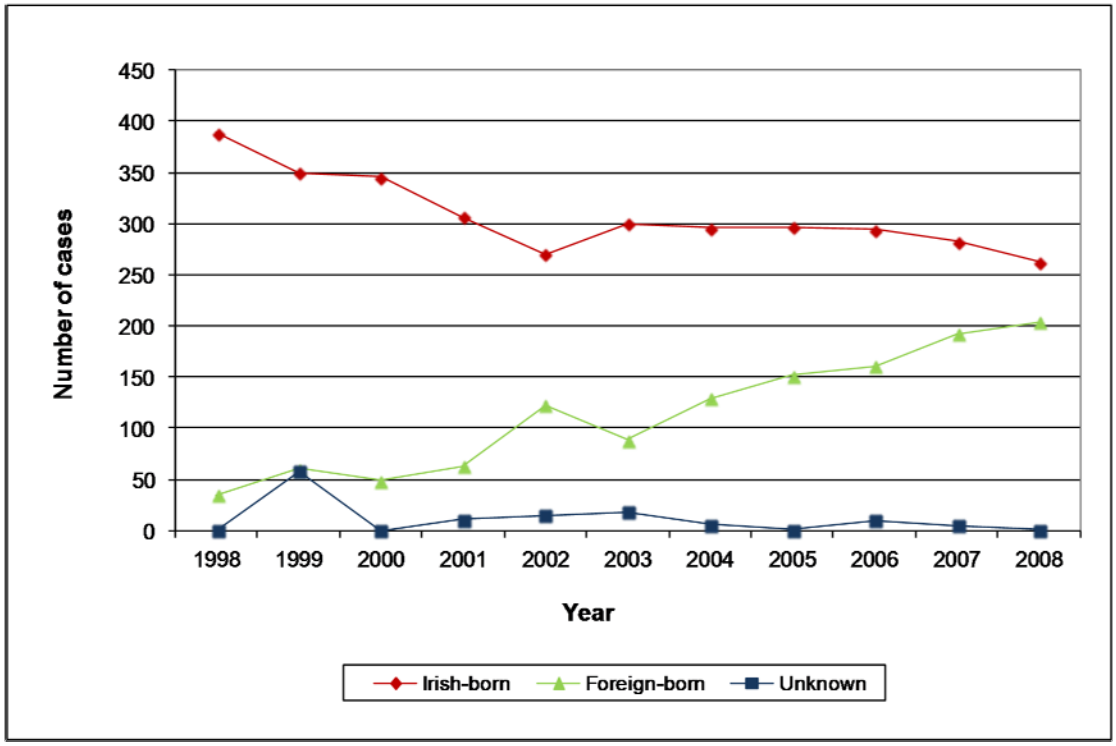

Figure 7: TB cases by geographic origin, 1998 to 2008

Table 11: TB cases and rates per 100,000 population by HSE area and geographic origin, 2008

HSE Area	Irish-born			Foreign-born			Unknown	Total
	Cases	%	Rate	Cases	%	Rate		
HSE-E	121	51.1	9.8	116	48.9	48.1	0	**237**
HSE-M	7	29.2	3.2	17	70.8	56.0	0	**24**
HSE-MW	14	53.8	4.5	12	46.2	26.9	0	**26**
HSE-NE	10	55.6	3.0	8	44.4	13.8	0	**18**
HSE-NW	10	71.4	5.2	4	28.6	9.8	0	**14**
HSE-S	64	73.6	12.1	23	26.4	28.4	1	**88**
HSE-SE	18	60.0	4.5	12	40.0	22.6	0	**30**
HSE-W	19	61.3	5.5	12	38.7	18.9	0	**31**
Ireland	**263**	**56.3**	**7.4**	**204**	**43.7**	**33.3**	**1**	**468**

Table 12: Countries of origin of foreign-born patients with TB, 2008

Continent	Total	Country	Cases
Africa	**56**	Algeria	2
		Angola	2
		Botswana	1
		Burundi	1
		Cameroon	1
		Congo	2
		Eritrea	1
		Ethiopia	1
		Ghana	1
		Guinea	1
		Kenya	3
		Nigeria	16
		Senegal	1
		Somalia	5
		South Africa	11
		Sudan	3
		Uganda	1
		Zambia	1
		Zimbabwe	2
America	**4**	Brazil	3
		United States	1
Asia	**106**	Afghanistan	1
		Bangladesh	3
		Bhutan	1
		China	5
		Korea, Republic of	1
		India	40
		Iraq	1
		Malaysia	1
		Myanmar	1
		Mongolia	1
		Nepal	2
		Pakistan	25
		Philippines	19
		Syria	1
		Thailand	2
		Vietnam	2
Europe	**35**	Estonia	1
		France	2
		Georgia	1
		Lithuania	5
		Moldova, Rep of	1
		Poland	8
		Portugal	1
		Romania	7
		Russian Federation	2
		Turkey	1
		Ukraine	1
		UK	5
Unknown	**3**		
Total			**204**

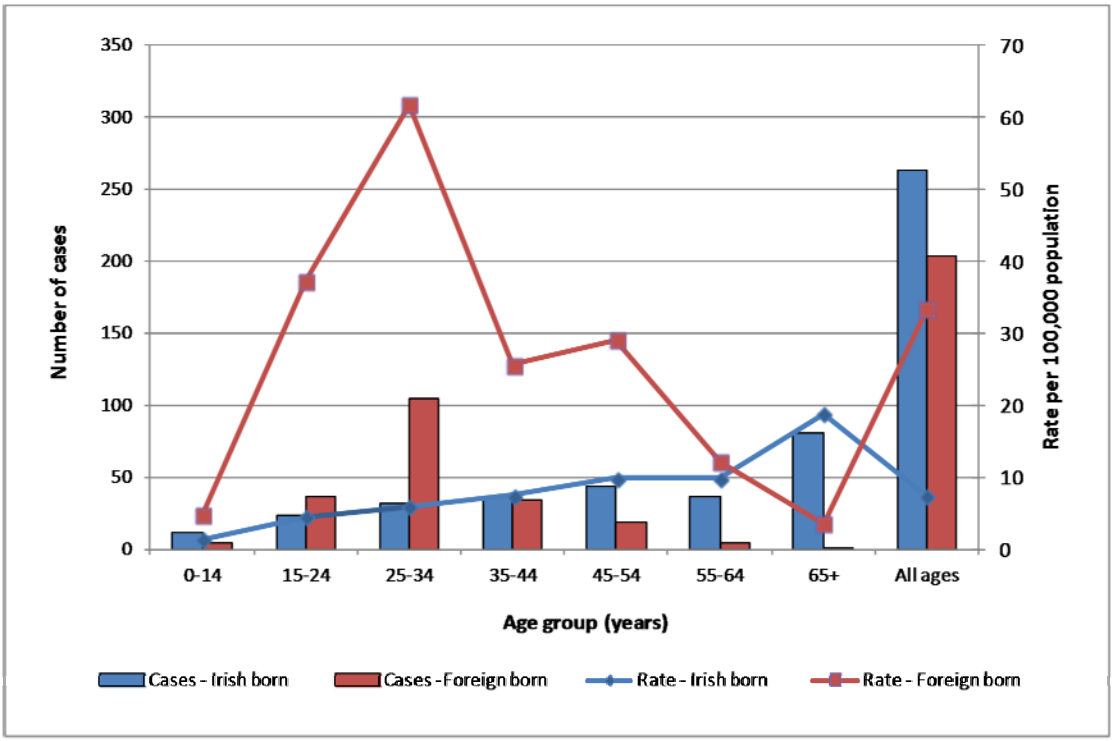

Figure 8: TB cases by age group (years) and age-specific rates by geographic origin, 2008

Site of disease

Of the 468 cases notified in 2008, 296 (63.2%) were pulmonary, 131 (28.0%) were extrapulmonary, 40 (8.5%) were pulmonary and extrapulmonary and one (0.2%) was unknown. 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, 2008

HSE area	Pulmonary only		Extrapulmonary only		Pulmonary + Extrapulmonary	
	Cases	% of total	Cases	% of total	Cases	% of total
HSE-E	159	67.1	59	24.9	19	8.0
HSE-M	16	66.7	5	20.8	3	12.5
HSE-MW	15	57.7	10	38.5	1	3.8
HSE-NE**	12	70.6	5	29.4	0	0.0
HSE-NW	9	64.3	4	28.6	1	7.1
HSE-S	51	58.0	28	31.8	9	10.2
HSE-SE	18	60.0	7	23.3	5	16.7
HSE-W	16	51.6	13	41.9	2	6.5
Total	**296**	**63.2**	**131**	**28.0**	**40**	**8.5**

** Site of disease unknown in one case

Pulmonary TB cases

The WHO defines pulmonary TB, for the purpose of analysis, as any case that has a pulmonary disease component. There were 336 cases reported in 2008 with a pulmonary disease component (71.8% of all cases reported). Sputum smear and culture results for these cases are shown in table 14. Sputum microscopy results were available for 242 (72.0%) of the 336 cases. This is similar to the figure in 2007 (71.3%) and 2006 (74.0%) but is a decrease compared to the figures from 2005 (89.0%), 2004 (83.5%), 2003 (82.9%) and 2002 (82.6%).

Of the 336 pulmonary cases, 158 (47.0%) were sputum positive for AFB by microscopy and 244 (72.6%) were culture positive.

The proportion of pulmonary cases (with or without an extrapulmonary site) was higher in persons born in Ireland (80.6%) compared to those born abroad (60.8%).

Table 14: Sputum smear and culture status for pulmonary TB cases, 2008

Culture result	Sputum smear positive	Sputum smear negative	Sputum smear not done	Sputum smear unknown	Total
Culture positive	147	53	39	5	**244**
Culture negative	4	28	22	4	**58**
Culture not done	1	2	16	2	**21**
Culture not known	6	1	4	2	**13**
Total	**158**	**84**	**81**	**13**	**336**

Extrapulmonary TB cases

One hundred and thirty one cases (28.0%) had exclusively extrapulmonary TB of whom 68 (51.9%) were culture confirmed and forty two (32.1%) were histology positive.

One hundred and seventy one (36.5%) of all cases reported in 2008 had an extrapulmonary disease component. The extrapulmonary sites reported are shown in table 15. The most frequent sites of extrapulmonary disease reported were extra-thoracic lymph nodes (28.7%) and pleura (22.8%). There were six cases of TB meningitis in 2008.

Table 15: Extrapulmonary disease sites in notified cases, 2008[††]

Site of disease	Number of cases	Percentage
Lymph (extra-thoracic)	49	28.7
Pleural	39	22.8
Lymph (intra-thoracic)	23	13.5
Other	21	12.3
Spinal	7	4.1
Genitourinary	6	3.5
Meningeal	6	3.5
Site not specified	5	2.9
Bone	5	2.9
Disseminated	4	2.3
Peritoneal	3	1.8
CNS	2	1.2
Abdominal	1	0.6
Total	**171**	**100.0**

TB meningitis

There were six cases of TB meningitis reported in 2008 giving an incidence rate of 0.14 per 100,000 population (1.4 per million population). A profile of these cases is provided in table 16. Of the six cases, five were diagnosed as extrapulmonary and one was diagnosed as pulmonary and extrapulmonary. Three of the TB meningitis cases were culture confirmed.

Table 16: TB meningitis cases in Ireland, 2008

HSE Area	Age group (years)	History of BCG	Culture Status
HSE-SE	5-14	Yes	Negative
HSE-SE	25-34	Unknown	Negative
HSE-SE	65+	Unknown	Positive
HSE-E	25-34	Unknown	Positive
HSE-E	25-34	Yes	Positive
HSE-NW	65+	Unknown	Negative

[††] Includes extrapulmonary (E) and pulmonary plus extrapulmonary cases (P + E)

Between 1998 and 2008, a total of 69 cases of TB meningitis have been reported (table 17). The cumulative incidence rates of TB meningitis in each HSE area and in Ireland for 1998-2008 are shown in table 18. The highest cumulative rate of TB meningitis between 1998 and 2008 is in HSE South (3.4 per 100,000).

Table 17: Number of TB meningitis cases, 1998-2008

Year	Number of cases
1998	6
1999	7
2000	6
2001	2
2002	6
2003	8
2004	6
2005	9
2006	7
2007	6
2008	6

Table 18: Cumulative incidence rate of TB meningitis in Ireland, 1998-2008

HSE area	Cases 1998 to 2008	Cumulative incidence rate (per 100,000)	95% CI
HSE-E	24	1.7	1.0 - 2.4
HSE-M	0	0.0	0.0 - 0.0
HSE-MW	5	1.5	0.2 - 2.8
HSE-NE	7	2.0	0.5 - 3.5
HSE-NW	3	1.4	-0.2 - 2.9
HSE-S	20	3.4	1.9 - 5.0
HSE-SE	5	1.2	0.1 – 2.2
HSE-W	5	1.3	0.2 - 2.5
Ireland	**69**	**1.8**	**1.3 - 2.2**

Note: Calculations based on 2002 census figures

Bacteriological results
Of the 468 cases notified in 2008, 356 (76.1%) were laboratory confirmed by culture, microscopy or histology.

Of the 336 cases with a pulmonary component, 268 (79.8%) were laboratory confirmed (by culture, microscopy or histology) and of the 131 extrapulmonary cases, 88 (67.2%) were laboratory confirmed (by culture, microscopy or histology).

Culture
In 2008, 312 (66.7%) of all TB cases notified were culture positive. This is a slight increase on the percentage in 2007 (65.6%).

Of the 336 cases with a pulmonary component, 244 (72.6%) were culture confirmed and of the 131 extrapulmonary cases, 68 (51.9%) were culture confirmed. Table 19 shows a breakdown by culture status and HSE area of TB cases notified in 2008.

Species
Information on species was reported for 306 (98.1%) of the 312 culture-confirmed cases. Of the cases where species were reported, 294 (96.1%) were *M. tuberculosis* and 12 (3.9%) were *M. bovis.*

Table 19: Culture status of TB cases by HSE area, 2008

HSE area	Positive	Negative	Not done	Unknown	Total
HSE-E	175	45	16	1	**237**
HSE-M	21	3			**24**
HSE-MW	11	3		12	**26**
HSE-NE	12	2		4	**18**
HSE-NW	8	3	3		**14**
HSE-S	45	26	9	8	**88**
HSE-SE	18	11	1		**30**
HSE-W	22	3	6		**31**
Ireland	**312**	**96**	**35**	**25**	**468**

Anti-TB drug resistance

Information on the results of drug sensitivity testing (DST) was reported for 296 (94.9%) of the 312 culture-confirmed cases. Of the 296 cases where sensitivity results were reported, resistance was documented in 27 cases (9.1%; 5.8% of total cases), including two cases of MDR-TB (0.7%; 0.4% of total cases). Mono-resistance to isoniazid was recorded in 13 cases (3 *M. bovis*), to rifampicin in one case, to pyrazinamide in two cases, to ethambutol in one case, to streptomycin in five cases. Two cases were resistant to isoniazid plus streptomycin and one case was resistant to isoniazid plus other (drug unknown). Resistance to pyrazinamide has not been reported in *M. bovis* cases as *M. bovis* is innately resistant to pyrazinamide.

Sixteen (59.3%) of the drug resistant cases, including one of the two MDR-TB cases, were born outside Ireland. There were no XDR-TB cases reported in Ireland during 2008.

A summary of drug resistance in 2008 is shown in table 20 and the drug sensitivity results of the MDR-TB cases are shown in table 21.

Table 20: Summary of drug resistant TB cases in Ireland, 2008

DST results	Number of cases	% of total cases
Cases with DST results	296	63.2
Resistant cases	27	5.8
MDR-TB	2	0.4
Cases resistant to isoniazid and streptomycin	2	0.4
Cases resistant to isoniazid and other (unknown)	1	0.2
Mono-resistance to Isoniazid	13	2.8
Mono-resistance to Rifampicin	1	0.2
Mono-resistance to Pyrazinamide‡‡	2	0.4
Mono-resistance to Ethambutol	1	0.2
Mono-resistance to Streptomycin	5	1.1

Table 21: Sensitivity results of MDR-TB cases, 2008

Diagnosis	Isolate	Isoniazid	Rifampicin	Pyrazinamide	Ethambutol	Streptomycin
Pulmonary	M.TB	R	R	R	R	R
Pulmonary	M.TB	R	R	R	R	S

‡‡ Excludes the *M. bovis* cases which are innately resistant to pyrazinamide

Case classification

Using the ECDC case definitions (described in the Methods section), 2008 cases can be classified into confirmed, probable and possible cases as outlined in Table 22. Of the 468 cases, 312 (66.7%) were confirmed, 44 (9.4%) were probable and 112 (23.9%) were possible cases.

Table 22: Case classification of TB cases by site of disease, 2008 (using ECDC case definitions)

Site of disease	Confirmed		Probable		Possible		Total
	Cases	%	Cases	%	Cases	%	
Pulmonary	215	72.6	22	7.4	59	19.9	**296**
Pulmonary + Extrapulmonary	29	72.5	2	5.0	9	22.5	**40**
Extrapulmonary	68	51.9	20	15.3	43	32.8	**131**
Not specified	0	0.0	0	0.0	1	100.0	**1**
Total	**312**	**66.7**	**44**	**9.4**	**112**	**23.9**	**468**

Treatment outcome

Outcome was recorded for 414 (88.5%) of the 468 cases notified in 2008. Of the 414 cases, 338 completed treatment, 36 died, 30 were recorded as being lost to follow up, treatment was interrupted in nine cases and one case was still on treatment at the time of reporting. Of the 36 deaths reported, nine (1.9% of total cases) were attributed to TB.

Outcome was reported for 144 (91.1%) of the 158 smear positive cases. Of the 144, 120 completed treatment, 11 died, no case was still on treatment, eleven were lost to follow up and treatment was interrupted in two cases at the time of reporting. Of the 11 deaths among smear positive cases, three were attributed to TB.

Of the 27 drug-resistant cases, 19 completed treatment, one was still on treatment at the time of reporting, two were lost to follow up, three died, and treatment outcome was unknown in two cases. Of the two MDR-TB cases, both died (one not due to TB and one unknown cause)

Details on treatment outcome for all cases and for smear positive cases only are shown in table 23 while treatment outcome by HSE area is shown in table 24.

Table 23: Treatment outcome for all cases and smear positive cases, 2008

Treatment outcome	Total		Smear Positive	
	Number	%	Number	%
Completed	338	72.2	120	75.9
Lost to follow up	30	6.4	11	7.0
Died (not attributed to TB)	25	5.3	6	3.8
Died (attributed to TB)	9	1.9	3	1.9
Died (cause unknown)	2	0.4	2	1.3
Interrupted (>2mths)	9	1.9	2	1.3
Still on treatment	1	0.2	0	0.0
Unknown	54	11.5	14	8.9
Total	**468**	**100**	**158**	**100**

Table 24: Treatment outcome by HSE area, 2008

		Outcome known	Outcome unknown	Total
HSE-E	Number	193	44	**237**
	%	*81.4*	*18.6*	***100***
HSE-M	Number	24	0	**24**
	%	*100*	*0.0*	***100***
HSE-MW	Number	26	0	**26**
	%	*100*	*0.0*	***100***
HSE-NE	Number	16	2	**18**
	%	*88.9*	*11.1*	***100***
HSE-NW	Number	14	0	**14**
	%	*100*	*0.0*	***100***
HSE-S	Number	80	8	**88**
	%	*91.0*	*9.1*	***100***
HSE-SE	Number	30	0	**30**
	%	*100.0*	*0.0*	***100***
HSE-W	Number	31	0	**31**
	%	*100*	*0.0*	***100***
Total	Number	**414**	**54**	**468**
	%	***88.5***	***11.5***	***100***

Case ascertainment

Table 25 summarises the method by which cases notified in 2008 were found. The majority (81.0%) presented as a case with a further 10.2% found by contact tracing.

Table 25: Method of case finding, 2008

Case found by	Number of cases	Percentage
Presenting as case	379	81.0
Contact tracing	49	10.5
Other	22	4.7
Other screening	5	1.1
Immigrant screening	2	0.4
Unknown	11	2.4
Total	**468**	**100.0**

Previous history of TB

Thirty-nine (8.3%) of the 468 cases were reported to have a previous history of TB. The previous year of diagnosis was provided for 27 cases and ranged from 1953 to 2007 with 14 of the 39 cases (35.9%) reported to have had TB in the previous ten years.

HIV status

Seventeen of the 468 cases (3.6%) notified in 2008 were reported as HIV positive while 69 (14.7%) were reported as HIV negative. Information on HIV status was not provided or was unknown for 382 (81.6%) of cases.

Discussion

This is the eleventh 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).

In 2008, 468 cases of TB were notified to HPSC, a national crude incidence rate of 11.0 per 100,000 population. This is similar to the rate reported in 2007 and 2006 but slightly higher than the rates reported between 2001 and 2005, which ranged from 9.7 per 100,000 to 10.6 per 100,000 population. It is lower than the crude incidence rates reported between 1992 and 1999, which ranged from 11.5 per 100,000 to 17.1 per 100,000 population. The overall notification rate in countries of the EU and Western Europe who report to ECDC was 16.7 per 100,000 population in 2008, ranging from 1.9 per 100,000 population in Iceland to 115.1 per 100,000 population in Romania.[2]

Differences in age-standardised TB incidence rates persist between HSE areas with HSE East and HSE South having the highest rates in 2008 followed by HSE Midland. HSE North East had the lowest rate in 2008, followed by HSE North West, HSE South East, HSE Mid-West and HSE West. Certain local health offices (LHOs) were found to have particularly high rates of TB incidence including Dublin South City, Dublin West, Dublin North Central and Dublin North West in HSE East and Cork North Lee in HSE South. According to the 2006 Census, between 19 to 30% of the population in these LHOs belong to social class 6 and 7 (see Appendix 2 for descriptions of social class).

The highest age-specific rates (per 100,000) in 2008 occurred among those aged 25-34 years (19.0) and those over 65 years (17.7).

Rates among males were higher than females for all age groups except for those in the 0-14 year age group. In 2008, the highest rate in females was in those aged 24-34 years (18.8) and the highest rate among males was in those aged 65 years and over (24.6). The male to female ratio (1.5:1) reported in 2008 was consistent with the rate reported in 2007 (1.6:1) and 2006 (1.5:1). Males are predominant among TB cases in nearly all European countries with an overall M:F ratio in 2008 of 2.0:1.[2]

During 2008, 43.6% of TB cases notified were born outside Ireland. This proportion has steadily increased and compares to 40.0 % in 2007, 34.6% in 2006, 33.8% in 2005, 30% in 2004, and 21.9% in 2003. In 2008, among countries in the EU and Western Europe who reported data to ECDC, 22.4% of notifications were in foreign-born patients. In the United Kingdom, France and Belgium, where crude incidence rates are similar to those reported in Ireland, the percentage of cases of foreign origin in 2008 ranged from 46 to 65%.[2] The crude rate of TB notifications in the indigenous population was 7.4

per 100,000 population which is similar to the rate in 2007 (8.0) and in 2006 (8.3). The crude rate in foreign-born cases was 33.3 which is slightly higher than the rate in 2007 (31.3) and in 2006 (26.3).

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 52 years. In cases born outside Ireland, the peak occurred in those aged 25-34 years with a median age of 29 years.

There were six cases of TB meningitis in 2008, a rate of 1.4 per million population. Of the six cases of TB meningitis, one was in the 5-14 year age group, three were in the 25-34 year age group and two were older than 65 years. Between 1998 and 2008, five cases of TB meningitis were reported among 0-4 year olds. The Health Protection Surveillance Centre *Guidelines on the prevention and control of tuberculosis in Ireland 2010*[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 2004 and 2008, there was one case of TB meningitis in a child aged less than five years of age, in 2006, giving an average notification rate of 0.4 per 10 million population. The criteria for discontinuation of BCG vaccination and how they apply to Ireland are outlined in Appendix 3.

In 2008, 312 (66.7%) of all cases of TB notified were culture positive. This is a slight increase on the proportion reported in 2007 (65.6%). In the 25 EU countries (Austria and Luxembourg, no data), the culture confirmed rate ranged from 34.6% (in Italy) to 94.4% (in Slovenia). Over12.0% (60 cases) of all Irish cases reported to HPSC were either culture unknown (25 cases) or culture not done (35 cases). It is important that we strive to improve the quality of data relating to the culture status of TB cases in the coming years.
Pulmonary TB was reported in 71.8% of cases and 28.0% had exclusively extrapulmonary TB. Forty seven percent of pulmonary TB cases were sputum smear positive and the sputum smear-positive rate for 2008 was 3.7 per 100,000 population.

There were 27 drug-resistant cases notified in 2008, including two cases of MDR-TB. MDR-TB cases and cases resistant to isoniazid represented 0.4% and 3.4% of total cases respectively. This compares to 1.5% and 4.0% respectively in 2007. In 2008 the proportion of new cases with MDR-TB ranged from 0-25% in the EU and Western Europe. 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.

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 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, 8]

In recent years, the quality of the data, and in particular, data on treatment outcome, has improved greatly. Information on treatment outcome was provided for 88.5% of cases notified in 2008, which is a slight increase on the proportion in 2007 (86.8%). This compares to 87.1% in 2005, 84.3% in 2004, 84.8% in 2003, 77.2% in 2002 and 59.8% in 2001. 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.

Guidelines on the Prevention and Control of Tuberculosis in Ireland were published in April 2010. [7]These guidelines are an update on the Report of the Working Party on Tuberculosis, originally published by the Department of Health in 1996.[9] All the sections from the original guidelines have been updated and a new section on infection prevention and control has been added. The recommendations in these guidelines are based on a review of international literature, expert opinion and an extensive consultation process. They provide advice on the diagnosis and treatment of active TB and latent TB Infection (LTBI), contact tracing procedures and screening for TB in special situations e.g. healthcare settings, new entrants to Ireland, prison and homeless settings. Chapters on infection prevention and control, TB and HIV infection and BCG vaccine are also included. The guidelines aim to improve the prevention and control of the disease and to help Ireland meet World Health Organization (WHO) targets for the elimination of TB. The WHO aims to reduce the global incidence of TB to less than one case per million population by 2050, which will eliminate the disease as a global health problem.[8] 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 implement effective TB prevention and control strategies in Ireland and in order to reach the elimination target by 2050.

References

1. World Health Organization. Global Tuberculosis Control: A short update to the 2009 report. WHO, Geneva, Switzerland. 2009.
2. European Centre for Disease Prevention and Control/WHO Regional Office for Europe: Tuberculosis Surveillance in Europe 2008. Stockholm, European Centre for Disease Prevention and Control, 2010. http://ecdc.europa.eu/en/publications/Publications/1003_SUR_Tuberculosis_Surveillance_in_Europe_2008.pdf
3. European Commission. 2008/426/EC: Commission Decision of 28 April 2008 amending Decision 2002/253/EC laying down case definitions for reporting communicable diseases to the Community Network under Decision No 2119/98/EC of the European Parliament and the Council (notified under document number C(2008) 1589). Official Journal of the European Communities 2008; 159(18/06/2008): 46-90.
4. World Health Organization. Definition of a new sputum smear-positive TB case. 02/04/2007. Geneva, Switzerland. Available at: http://www.who.int/tb/dots/laboratory/policy/en/index1.html
5. World Health Organization, Global Task Force on XDR-TB, outcomes and recommendations, October 2006. Available at http://www.who.int/mediacentre/news/notes/2006/np29/en/index.html
6. Central Statistics Office, Dublin. Census 2006. Dublin, 2007.
7. Health Protection Surveillance Centre. Guidelines on the prevention and control of tuberculosis in Ireland 2010. Health Protection Surveillance Centre, Dublin, 2010.
8. World Health Organization, Stop TB Partnership. The global plan to stop TB 2006-2015. Actions for life-towards a world free of tuberculosis.
9. Department of Health. Report of the Working Party on Tuberculosis. 1996, Dublin.
10. International Union against Tuberculosis and Lung Disease. Criteria for discontinuation of vaccination programmes using Bacille Calmette-Guerin (BCG) in countries with a low prevalence of tuberculosis. A statement of the International Union against Tuberculosis and Lung Disease. *Tuber Lung Dis,* 2004; **75**(3): 179-80.

Appendix 1: TB Cases Notified in Ireland in 2009, Provisional Data (as of 31st August 2010)

There were 472 cases of TB provisionally notified in 2009. 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 A1.

Table A1: Provisional summary of the epidemiology of TB in Ireland, 2009

Parameter	2009
Total number of cases	472
Crude notification rate per 100,000	11.1
Cases in indigenous population[§§]	267 (56.6%)
Cases in foreign-born persons	191 (40.5%)
Culture positive cases	242 (51.3%)
Pulmonary cases[***]	311 (65.9%)
Of which sputum smear positive	136 (43.7%)
Resistant cases	12 (2.5%)
Multi-drug resistant cases	0 (0.0%)
TB meningitis cases	7 (1.5%)

Crude incidence rates by HSE area

The total number of TB cases in each HSE area is shown in table A2 with crude incidence rates and 95% confidence intervals included.

Table A2: Provisional TB cases in each HSE area, 2009

HSE Area	Number of cases	Crude rate per 100,000	95% CI for rate
HSE-E	219	14.6	12.7 - 16.5
HSE-M	25	9.9	6.0 - 13.8
HSE-MW	27	7.5	4.7 – 10.3
HSE-NE	26	6.6	4.1 – 9.1
HSE-NW	25	10.5	6.4 – 14.7
HSE-SE	39	8.5	5.8 – 11.1
HSE-S	85	13.7	10.8 – 16.6
HSE-W	26	6.3	3.9 – 8.7
Ireland	**472**	**11.1**	**10.1 - 12.1**

[§§] Country of birth unknown for 14 cases

[***] Includes the cases categorised as pulmonary +extrapulmonary (P+E)

Age and Gender
There were 293 cases (62.1%) of TB notified in males and 175 cases (37.1%) in females, giving a male to female ratio of 1.7:1. The mean age of cases notified was 44 years (range 0 to 91 years).

Geographic origin
Of the 472 cases provisionally notified in 2009, 267 (56.6%) were born in Ireland and 191 (40.5%) were foreign-born. Information on country of birth was not reported for 14 cases (3.0%).

Site of disease
Of the 472 cases provisionally notified in 2009, pulmonary TB was diagnosed in 292 cases (61.9%), extrapulmonary TB in 159 cases (33.7%) and pulmonary and extrapulmonary TB in 19 cases (4.0%). The site of disease was unknown for 2 cases (0.4%).

Of the 311 cases with a pulmonary disease component, 171 (55.0%) were culture positive and 136 (43.7%) were smear positive.

TB meningitis
There were seven cases of TB meningitis provisionally notified in 2009 giving an incidence rate of 0.17 per 100,000 population (1.7 per million population). Two of the cases were in the 0-4 year age group, two were in the 25-44 year age group, two were in the 45-64 year age group and one was aged over 65 years. Five of the cases were reported as having received the BCG vaccination. Three cases were culture positive (one each in the 25-34 year, 35-44 year and 55-64 year age groups) and one was culture negative (in the 0-4 year age group).

Culture
Of the 472 cases provisionally notified in 2009, 242 (51.3%) were culture confirmed.

Species
Among the 242 culture positive cases, 221 (91.3%) were *M. tuberculosis* and four (1.7%) were *M. bovis*. The species was not provided for 17 (7.0%) of the culture positive cases.

Antibiotic resistance
Resistance was reported in 12 of the 242 culture positive cases (5.0%). Mono-resistance to isoniazid was reported in six cases. Mono-resistance to pyrazinamide, to ethambutol, and to streptomycin was recorded in one case each. Two cases were resistant to isoniazid plus streptomycin and one case was resistant to isoniazid, pyrazinamide plus streptomycin. There were no cases of MDR-TB.

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 Health Protection Surveillance Centre *Guidelines on the prevention and control of tuberculosis in Ireland 2010*,[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 2008 report is the eleventh 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 2008, the national rate for sputum smear positive pulmonary TB was 3.7 per 100,000 population while in 2007 and 2006 the rates were 3.6 and 3.7 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: Over the previous five years (2004-2008), the average annual notification rate of TB meningitis in children aged less than five years was 0.42 per 10 million general population. Between 2004 and 2008, there was one case of TB meningitis in a child under five years of age in 2006. However, in 2009 (provisional data), two cases of TB meningitis were reported in the 0-4 year age group.

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 2008 age-specific incidence rate for children 0-14 years was 1.7 per 100,000, nearly 7 times the rate recorded in Sweden when they discontinued neonatal BCG vaccination. In 2007, 2006, 2005, and 2004, the age-specific incidence rate for children aged 0-14 years was 4.7, 2.4, 3.0 and 1.2 per 100,000 population espectively.

Index of Tables and Figures

Tables

Figures