Health Protection Surveillance Centre

Report on the Epidemiology of Tuberculosis in Ireland 2009

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

hpsc

Epidemiology of Tuberculosis in Ireland 2009

A Report by the
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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 Sarah Jackson, Joan O'Donnell and Darina O'Flanagan, HPSC.

Summary

- There was a slight increase in the number of TB case notifications in 2009 (n=479, rate 11.3/100,000) compared to 2008 (n=468, rate 11.0/100,000).
- A regional variation was noted in TB notification rates (per 100,000) ranging from 5.1 in HSE West to 15.7 in HSE East.
- Certain local health offices in HSE East (Dublin South City, Dublin West, Dublin North Central and Dublin North West) reported rates greater than 20 per 100,000 population in 2009.
- The highest age-specific rate in 2009 occurred among those aged 65 years and older (18.4/100,000).
- The age-specific rate (per 100,000) among 55-64 years olds increased from 9.8/100,000 in 2008 to 13.3 in 2009.
- 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 65 years and older and among females in those aged 25-34 years.
- In 2009, 43.0% of cases were born outside Ireland compared to 43.3% in 2008, 40.1% in 2007 and 34.6% in 2006.
- There was a notable difference in age between cases born in Ireland (median age 53 years) and cases born outside Ireland (median age 32 years).
- In 2009, 314 (65.6%) of the TB cases had a pulmonary disease component of which 243 (77.4%) were culture positive and 139 (44.3%) were smear positive.
- There were eight cases of TB meningitis notified in 2009 (age range: 0 to 76 years).
- Treatment outcome data were provided for 82.5% of cases. Treatment was completed for 307 (64.1%) cases and for 100 (71.9%) smear positive cases notified in 2009.
- There were 34 deaths reported (10 attributable to TB).
- There were 26 drug-resistant cases notified in 2009, including one MDR-TB case. There were no cases of XDR-TB reported in 2009.
- There were 427 cases of TB provisionally notified in 2010 which is a decline from 479 cases reported in 2009.

Introduction

The World Health Organization (WHO) has estimated that globally there were 8.8 million new cases of tuberculosis (TB) in 2010 (128 per 100,000 population). Of these, 2.6 million (57%) were new pulmonary sputum smear positive cases. Approximately 1.45 million TB deaths occurred globally in 2010.[1]

In 2009, 396,992 cases of TB were reported by 51 of the 54 countries of the WHO European Region. The overall notification rate averaged at 44.4 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 plus Iceland and Norway) at 15.8 per 100,000 population, with rates lower than 10 per 100,000 reported in 17 countries and higher than 20 per 100,000 in Romania (108.2), the Baltic States – Lithuania (62.1), Latvia (43.2) and Estonia (30.7), Bulgaria (38.3), Portugal (27.0) and Poland (21.6).

In 2009, 23.6% of reported TB cases in Western Europe were of foreign origin. This proportion ranged from 0.2% to 89.0% across 29 countries. Multidrug-resistance remained most frequent in the Baltic States (combined MDR: 17.4%-28.0%) followed by Cyprus (12.9%) and Romania (11.2%). Other countries reported lower levels of MDR (0-8%) where it is generally more common in foreign-born cases.

In 2009, 317,327 notifications were reported from the 24 non-EU European and central Asian countries of which 49.2% were from the Russian Federation. The highest rates per 100,000 population in this region were reported by Kazakhstan (195.6) and Moldova (155.2) while the lowest rates were reported by Israel (4.8) and Switzerland (7.3). The highest burden of MDR-TB cases in the European region is in this area where the prevalence is 14.4% in newly diagnosed cases, five times higher than the prevalence reported in the EU/EEA countries (2.8%).

Overall, the proportion of cases with multidrug-resistant TB (MDR-TB) across the entire European region was 20.5% a slight increase compared to 2008 (18.0%). The proportion of total cases with MDR-TB was higher in the non-EU countries of Europe (24.4%) compared to the proportion in Western Europe (5.3%). The increase was attributed to improvements in drug susceptibility testing (DST) coverage.

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 new guidelines for TB prevention and control in Ireland were published in April 2010.[3]

This report presents an epidemiological review of all TB cases notified in 2009. Data for 2009 have been validated and updated to include information relating to treatment outcome. Provisional data for 2010 are presented in Appendix 1.

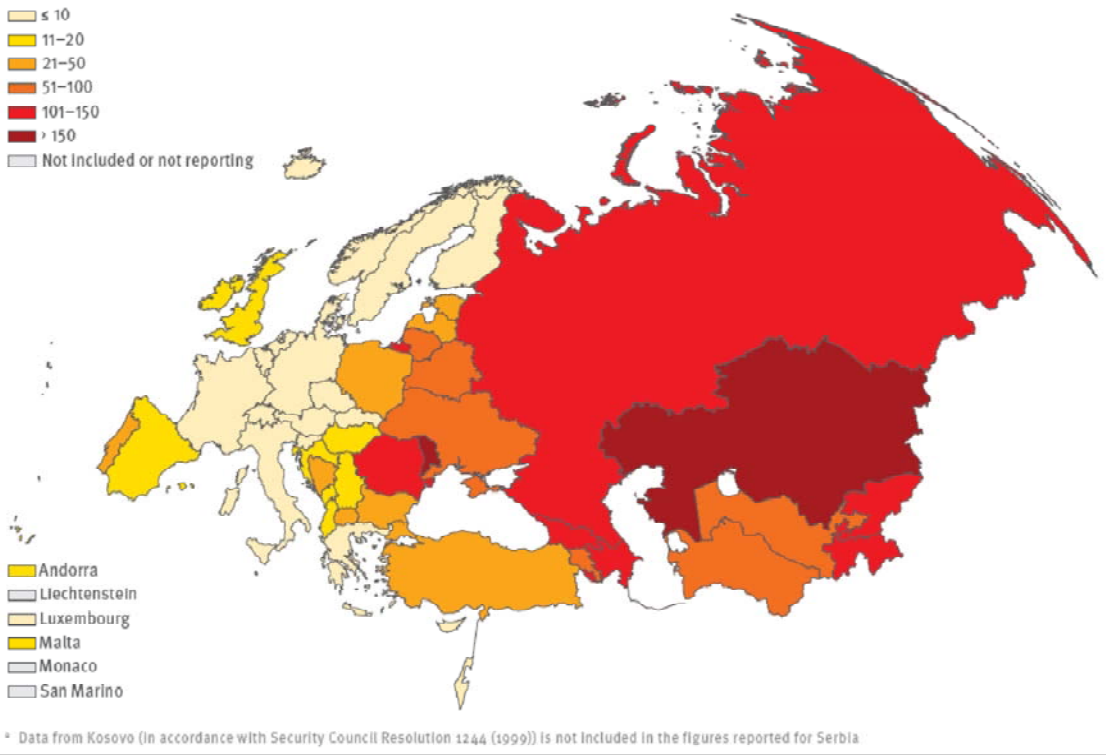

Figure 1: Tuberculosis notification rates per 100,000 population, WHO European region, 2009[2]

Case Definition

The case definition used for the analyses in this report is the Irish TB case definition under SI No. 452/2011 Infectious Diseases (Amendment) Regulations 2011.[4] This case definition is also in harmony with the 2008 EU case definition.

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 and at least one of the following two:

- Isolation of *M. tuberculosis* complex (excluding *Mycobacterium. 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 and at least one of the following three:

- 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

Definitions

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[5]**:** 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 new case is defined as a patient where no previous history of TB was reported.

A recurrent case is defined as a patient with a documented history of TB prior to their 2009 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.[6]

TB Outbreak

In general an outbreak is defined as the occurrence of cases of active TB disease* above the expected level usually over a given period of time† in a geographic area, facility or within a specific population group.[3]

The following are examples of situations to report:

- An unexpected increase (significantly above baseline) of newly identified TB‡ cases in any setting
- Two or more TB cases on treatment from a congregate (e.g. school or prison) or high risk setting (e.g. HIV positive individuals occurring within a relatively short space of time).†

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* This definition of a TB outbreak relates to cases of TB disease only and not to cases of latent TB infection (LTBI).

† In general, within 6 months but outbreaks over longer periods may also be considered where epidemiological/microbiological evidence suggests that cases are linked. This should be based on local risk assessment or in consultation with HPSC if deemed appropriate.

‡ TB cases as defined by the new Irish case definition, see http://www.hpsc.ie/hpsc/NotifiableDiseases/CaseDefinitions/

- Three or more TB cases on treatment from a community setting (outside a household) occurring within a relatively short period of time[†] that may be related.
- Three or more TB cases on treatment in a household
- Two or more cases of MDR-TB (multidrug-resistant TB) or XDR-TB (extensively drug-resistant) that may be related and occur outside a household

When assessing whether a cluster of TB cases represents an outbreak, indicators to consider include:

- Epidemiological links between cases
- Similar unique characteristics among cases
- Matching drug resistance patterns of isolates
- Matching DNA fingerprint patterns of isolates

[†]In general, within 6 months but outbreaks over longer periods may also be considered where epidemiological/microbiological evidence suggests that cases are linked. This should be based on local risk assessment or in consultation with HPSC if deemed appropriate.

Methods

Data collection

An enhanced TB notification form was completed by public health doctors for each case of TB notified in 2009. 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 2009 data (with outcome information) and provisional 2010 data to HPSC between April and September 2011. Data were validated with each area and national data were collated.

The introduction of the amendment to the Infectious Disease Regulations 1981 on January 1st 2004, made outbreaks, unusual clusters or changing patterns of illness statutorily notifiable by medical practitioners and clinical directors of laboratories to the medical officer of health. Standard reporting procedures for the surveillance of TB outbreaks were formally agreed in 2007. Outbreak data are collated on the Computerised Infectious Disease Reporting (CIDR) system. This is the first year that outbreak data are included in this report.

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, 2009 and 2010 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 28 and table 32, volume 4, 2006 census. These data represent persons usually resident in each province and county, and present in the state on census night. The indigenous population was defined as those persons who were born in Ireland.[7]

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 2009 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.

Data completeness

For the case based dataset, 18 key variables from NTBSS were analysed for completeness. Appendix 2 shows the completeness of reporting for these variables during 2009. This is the first year that completeness of data is described in this report.

Results: TB cases in Ireland, 2009

Overall cases and rates

There were 479 cases of TB notified in 2009, a rate of 11.3 per 100,000 population. A summary of the 2009 data is shown in table 1.

Table 1: Summary of the epidemiology of TB in Ireland, 2009

Parameter	Number (Rate/100,000)	% of Total
Total cases	479 (11.3)	-
Cases in indigenous population[§]	270 (7.6)	56.4
Cases in foreign-born persons[*]	206 (33.6)	43.0
Culture positive cases	341	71.2
Pulmonary cases	314	65.6
Smear positive pulmonary cases	139	29.0
Multidrug-resistant cases	1	0.2
Mono-resistant to isoniazid	11	2.3
Deaths attributable to TB	10	2.1
Outcomes reported in cases	395	82.5
TB meningitis cases	8	1.7

[§] Country of birth was unknown for 3 (0.6%) cases

The number and rates of TB cases notified for each of the years from 1991-2009 are shown in table 2. Three-year moving averages for the years 1992-2008 are also shown.

Table 2: Number and rates of notified cases of TB in Ireland, 1991-2009 with 3-year moving averages, 1992-2008

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	413
2004	431	10.2	430
2005	450	10.6	449
2006	465	11.0	465
2007	480	11.3	473
2008	468	11.0	474
2009	479	11.3	

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 15.7 per 100,000 population which was significantly higher than the national rate. Rates in HSE North East (6.9) and HSE West (5.1) were also significantly lower than the national rate.

The crude incidence rates seen in each HSE area from 1992 to 2009 are shown in table 4 while the 3-year moving average TB notification rates for each HSE area from 1992 to 2008 are shown in table 5.

Table 3: Notified TB cases by HSE area, 2009

HSE area	Number of cases	Crude rate per 100,000	95% CI for rate
HSE E	235	15.7	13.7 - 17.7
HSE M	25	9.9	6 - 13.8
HSE MW	27	7.5	4.7 - 10.3
HSE NE	27	6.9	4.3 - 9.4
HSE NW	25	10.5	6.4 - 14.7
HSE SE	37	8.0	5.4 - 10.6
HSE S	82	13.2	10.3 - 16.1
HSE W	21	5.1	2.9 - 7.2
Ireland	**479**	**11.3**	**10.3 - 12.3**

Table 4: Crude TB incidence rates per 100,000 population by HSE area, 1992-2009

Year	HSE E	HSE M	HSE MW	HSE NE	HSE NW	HSE SE	HSE S	HSE W	National
1992	16.1	18.7	20.9	10.0	15.9	12.3	21.4	22.2	**17.1**
1993	11.9	10.8	16.1	10.0	37.5	16.7	23.9	23.0	**17.0**
1994	12.9	14.6	17.3	11.4	9.0	11.0	17.4	22.7	**14.5**
1995	11.9	8.8	15.1	8.5	11.4	9.5	20.5	11.1	**12.6**
1996	8.7	8.3	17.7	12.1	7.1	6.9	22.5	13.1	**12.0**
1997	9.9	9.2	12.6	9.1	10.4	12.8	16.5	11.1	**11.5**
1998	11.7	4.9	14.8	9.5	9.0	8.9	14.3	15.3	**11.7**
1999	13.9	7.3	17.0	8.2	9.0	7.9	13.7	19.9	**12.9**
2000	10.2	7.1	13.8	6.1	4.1	9.7	13.8	10.0	**10.1**
2001	12.3	3.1	7.1	11.0	5.9	4.7	12.4	8.9	**9.7**
2002	11.6	8.4	9.7	7.0	5.4	11.6	13.3	8.7	**10.5**
2003	11.9	5.3	12.1	7.5	4.1	8.3	16.0	6.0	**10.4**
2004	12.7	3.6	12.2	5.8	6.7	7.4	12.6	10.4	**10.2**
2005	12.9	6.4	14.7	3.3	6.3	8.0	12.2	10.9	**10.6**
2006	12.7	6.0	10.2	8.4	3.8	11.1	15.3	7.7	**10.9**
2007	14.6	6.4	8.3	6.1	7.2	6.3	16.4	10.6	**11.3**
2008	15.9	9.5	6.9	4.6	5.9	6.5	14.0	7.5	**11.0**
2009	15.7	9.9	7.5	6.9	10.5	8.0	13.2	5.1	**11.3**

Table 5: 3-year moving average TB notification rate per 100,000 population by HSE area, 1992-2008

Year	HSE E	HSE M	HSE MW	HSE NE	HSE NW	HSE SE	HSE S	HSE W	National
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	14.2	21.6	22.7	**16.4**
1994	12.4	12.2	16.5	10.3	16.7	12.0	19.8	19.9	**14.6**
1995	11.3	10.1	16.3	10.1	9.7	9.2	20.2	14.5	**12.9**
1996	9.8	8.6	15.8	10.5	9.0	9.0	20.5	12.1	**12.0**
1997	10.1	7.9	14.4	10.0	9.2	10.3	17.4	12.6	**11.7**
1998	11.8	6.6	14.8	9.1	9.4	9.6	14.7	15.4	**11.9**
1999	12.4	6.6	15.7	8.0	7.8	8.6	13.9	16.3	**11.9**
2000	11.7	6.2	12.9	7.8	5.8	8.0	13.4	12.2	**10.7**
2001	11.6	5.4	9.4	8.8	5.3	7.7	13.0	9.1	**10.0**
2002	11.9	6.3	9.6	8.1	5.2	9.0	13.7	8.1	**10.3**
2003	12.0	5.7	11.5	7.0	5.1	8.9	14.5	7.8	**10.4**
2004	12.6	4.7	12.8	5.6	6.0	7.8	13.4	9.4	**10.3**
2005	12.8	5.6	12.9	5.2	5.8	8.6	13.1	10.0	**10.6**
2006	13.2	6.2	10.9	6.5	5.3	9.1	14.8	9.2	**10.9**
2007	14.5	7.1	8.4	6.3	6.0	7.5	15.5	9.1	**11.2**
2008	15.5	8.8	7.4	5.5	7.4	6.8	14.4	7.7	**11.2**

Age and sex distribution

There were 176 (37.0%) cases of TB notified in females in 2009 and 300 (63.0%) in males, giving a male to female ratio of 1.7:1.0. Sex was not reported for three cases during 2009. Table 6 gives the breakdown of notified TB cases by sex and HSE area.

Table 6: TB cases by HSE area and sex, 2009

HSE area	Female	Male	Male:Female ratio	Total
HSE E	83	149	1.8	**232**
HSE M	13	12	0.9	**25**
HSE MW	7	20	2.9	**27**
HSE NE	12	15	1.3	**27**
HSE NW	7	18	2.6	**25**
HSE SE	13	24	1.8	**37**
HSE S	36	46	1.3	**82**
HSE W	5	16	3.2	**21**
Total	**176**	**300**	**1.7**	**476**

In 2009, the median age of cases was 40 years (range: 0-93 years). The median age for Irish-born cases was 53 years and 32 years for foreign-born cases. One hundred and twenty seven cases (26.5%) were aged between 25 and 34 years.

Table 7 shows the number of cases and the age-specific rates for males and females in 2009. The highest age-specific rate in 2009 occurred among those aged 65 years and older (18.4/100,000). The age-specific rate (per 100,000) among 55-64 year olds increased from 9.8/100,000 in 2008 to 13.3 in 2009.

Rates in males were higher than females in all age groups except in the 0-14 age group (F 2.4 vs. M 1.8). The highest rate among females was in the 25-34 year age group (13.2) and the highest rate among males was in the over 65 year age group (27.0). Figure 2 shows the cases by age and sex and the male and female age-specific rates in Ireland for 2009. Figure 3 shows the age-specific rates of TB in Ireland from 2000 to 2009.

Table 7: TB cases and age-specific rates per 100,000 population for males and females, 2009

Age Group (years)	Female		Male		Total	
	Cases	Rate	Cases	Rate	Cases	Rate
0-14	10	2.4	8	1.8	**18**	**2.1**
15-24	21	6.7	29	9.0	**50**	**8.1**
25-34	47	13.2	78	21.3	**125**	**17.6**
35-44	34	11.0	48	15.2	**82**	**13.2**
45-54	17	6.6	44	16.8	**61**	**11.7**
55-64	17	8.4	37	18.0	**54**	**13.3**
65+	30	11.5	56	27.0	**86**	**18.4**
Total	**176**	**8.3**	**300**	**14.1**	**476**	**11.3**

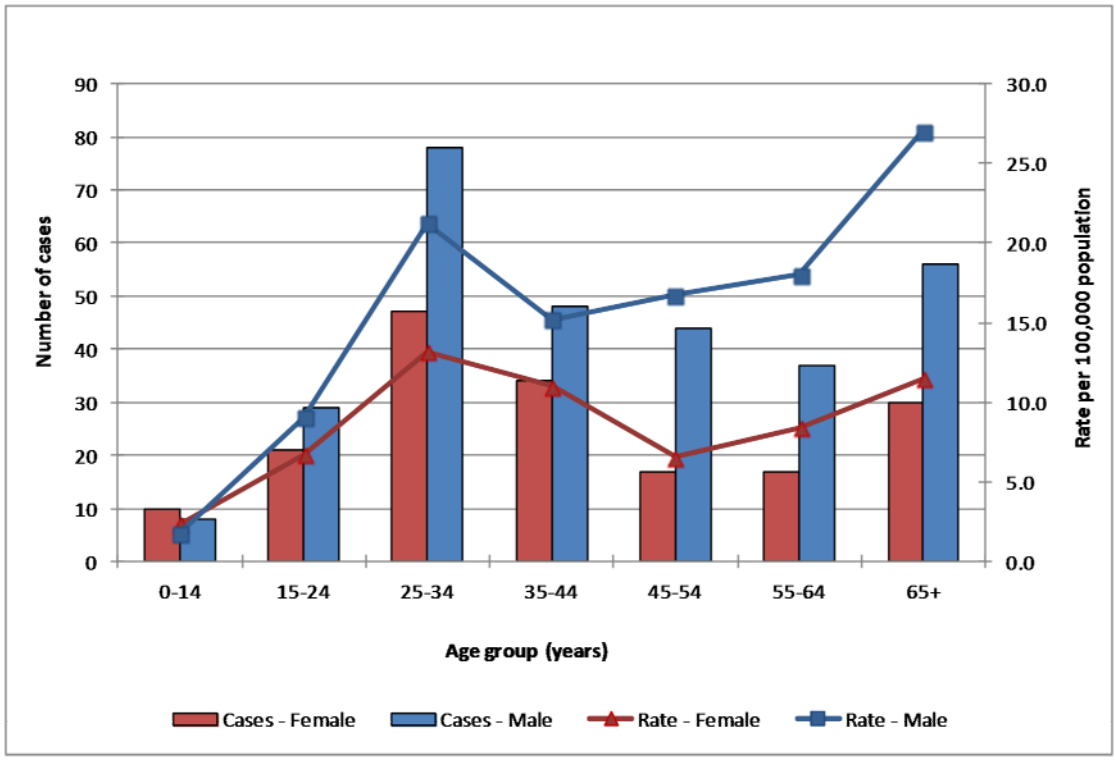

Figure 2: TB cases by age and sex, and age-specific rates per 100,000 population, 2009

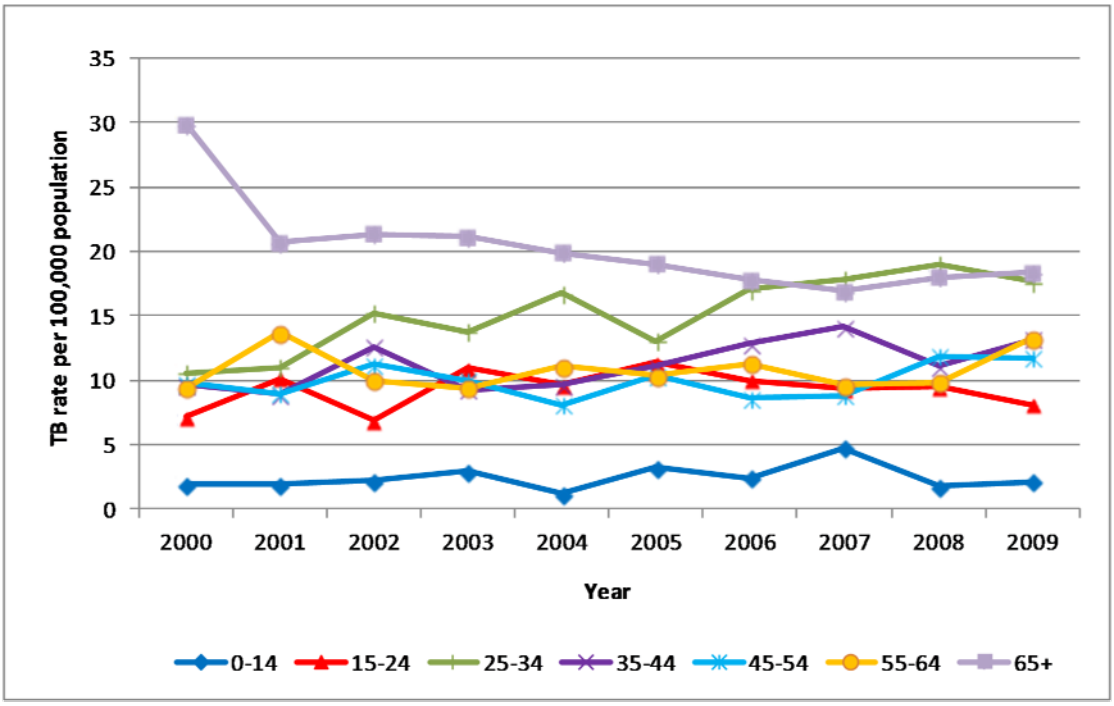

Figure 3: Age-specific rates of TB by year, 2000-2009

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 (15.4), HSE South (13.0) and HSE North West (10.7). The rate in HSE East was significantly higher than the national rate (11.3). The lowest rates were reported by HSE West (5.0) and HSE North East (7.1), both of which were significantly lower than the national rate.

Age-standardised incidence rates for each county for 2009 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 Waterford (17.7), Dublin (17.2), Sligo (16.0), Laois (15.5), Cork (15.3) and Longford (15.3). The lowest rates (per 100,000) were in Monaghan (1.8), Carlow (2.0), Mayo (2.0), Roscommon (2.5) and Wexford (3.2).

Crude incidence rates for each local health office (LHO)** in 2009 are shown in table 9. Three-year moving averages for the crude incidence rates are presented in table 10. In 2009, the highest crude rates (per 100,000 population) were in Dublin North West LHO (27.4), Dublin North Central LHO (23.7) and Dublin South City LHO (21.6) all located in HSE East.

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

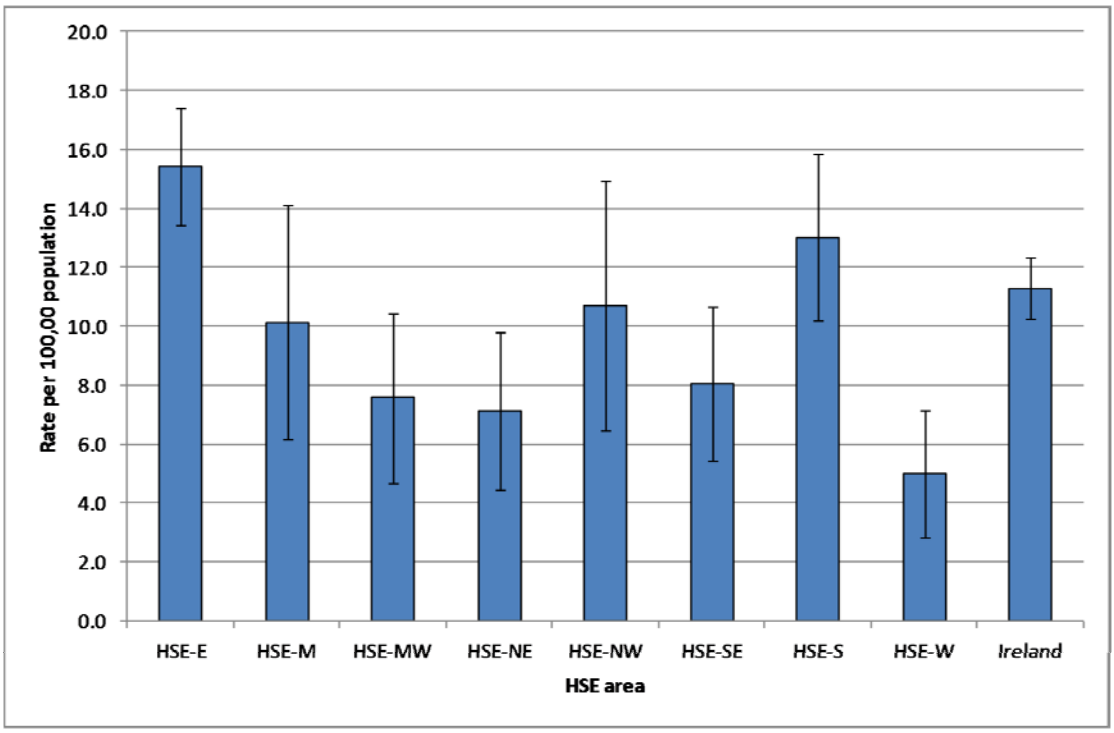

Figure 4: Age-standardised TB incidence rates per 100,000 population by HSE area with 95% confidence intervals, 2009

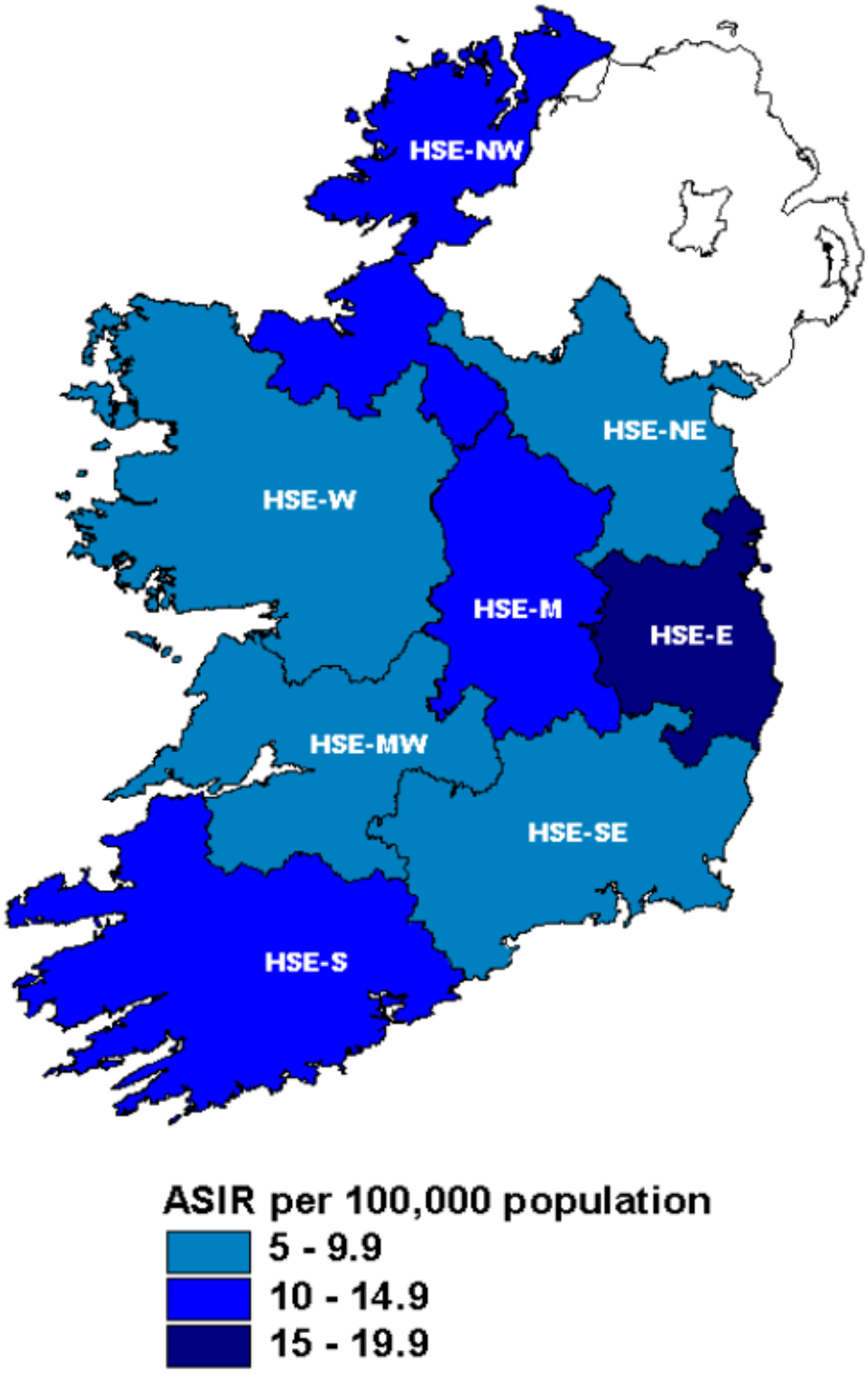

Figure 5: Age-standardised TB incidence rates per 100,000 population by HSE area, 2009

Table 8: Age-standardised TB incidence rates (per 100,000 population) by county with 95% confidence intervals, 2009

County	ASIR	95% CI
Dublin	17.2	14.9 - 19.6
Kildare	8.4	3.9 - 12.9
Wicklow	8.8	3.6 - 14
Laois	15.5	5.9 - 25.1
Longford	15.3	1.8 - 28.7
Offaly	7.4	0.9 - 13.8
Westmeath	6.3	0.8 - 11.8
Clare	7.4	2.3 - 12.6
Limerick	8.9	4.5 - 13.2
Tipperary North	4.4	-0.6 - 9.4
Cavan	11.1	2.8 - 19.4
Louth	6.5	1.7 - 11.3
Meath	8.1	3.5 - 12.8
Monaghan	1.8	-1.7 - 5.3
Donegal	9.0	4.1 - 14
Leitrim	8.0	-3.1 - 19.1
Sligo	16.0	6 - 26
Carlow	2.0	-1.9 - 6
Kilkenny	4.4	0.1 - 8.7
Tipperary South	10.8	3.7 - 17.9
Waterford	17.7	9.7 - 25.7
Wexford	3.2	0.1 - 6.3
Cork	15.3	11.8 - 18.8
Kerry	5.1	1.5 - 8.7
Galway	6.9	3.5 - 10.3
Mayo	2.0	-0.3 - 4.2
Roscommon	2.5	-1 - 6
Ireland	**11.3**	**10.3 - 12.3**

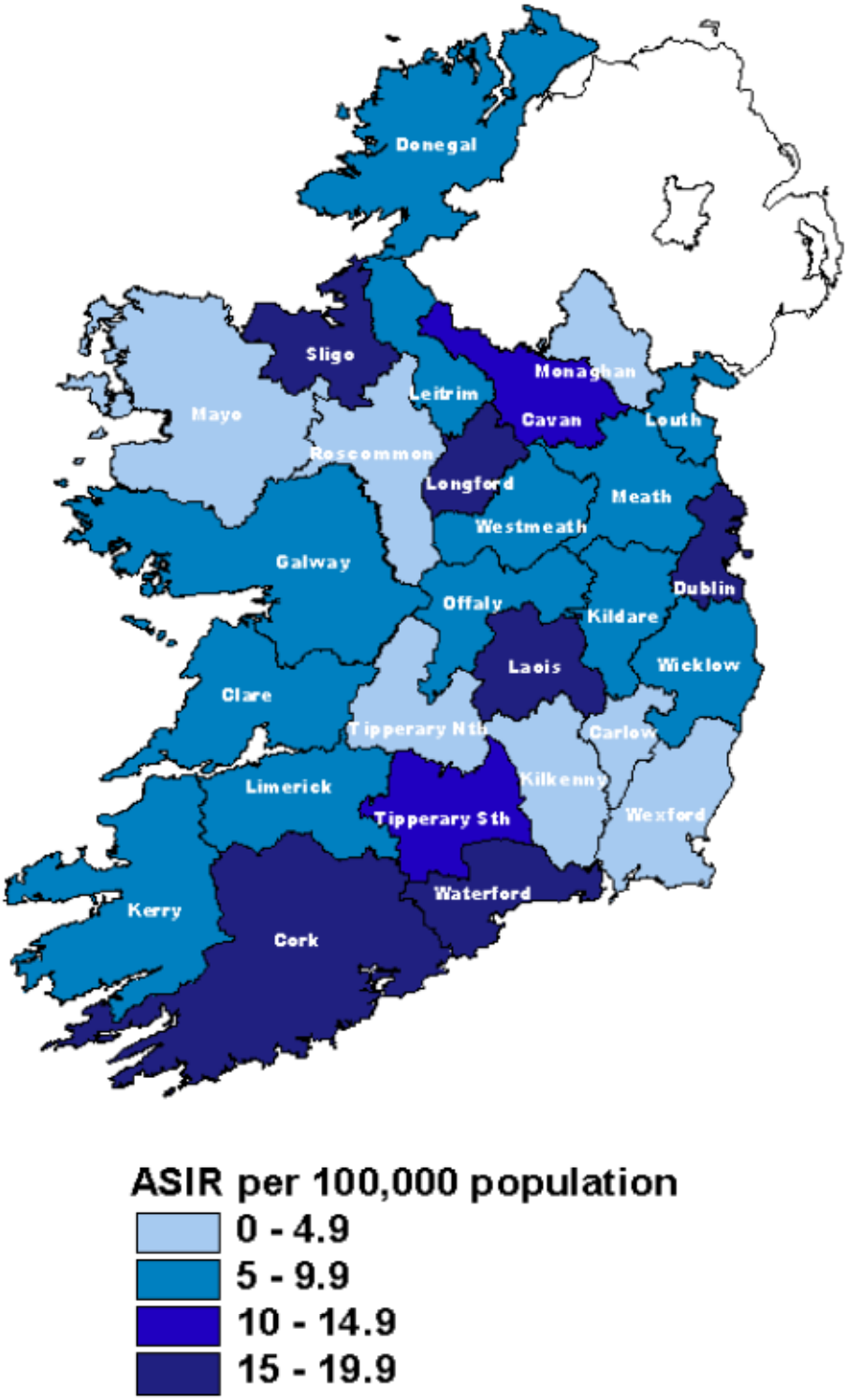

Figure 6: Age-standardised TB incidence rates per 100,000 population by county, 2009

Table 9: TB Crude incidence rate per 100,000 population by local health office (LHO[††]), 2000-2009

HSE area	LHO	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
HSE-E	**Total**	**10.2**	**12.3**	**11.6**	**11.9**	**12.7**	**12.9**	**12.7**	**14.6**	**15.9**	**15.7**
	Dublin South	5.4	2.3	4.7	4.7	9.5	4.0	5.5	8.7	4.7	7.1
	Dublin South East	13.3	5.7	8.6	7.6	10.0	7.2	5.4	10.0	15.4	9.1
	Dublin South City	7.7	26.1	21.5	23.0	23.1	20.1	19.4	29.8	29.8	21.6
	Dublin South West	6.9	8.2	7.5	10.3	8.1	12.2	5.4	14.9	6.8	18.3
	Dublin West	11.9	10.3	18.3	19.1	20.1	18.7	17.9	16.4	28.4	19.4
	Dublin North West	16.8	18.7	23.0	17.4	12.9	19.4	21.0	24.7	21.5	27.4
	Dublin North Central	18.8	27.8	18.8	21.2	26.9	23.7	26.1	23.7	24.5	23.7
	Dublin North	10.8	11.8	5.4	4.9	11.7	9.9	11.7	8.6	9.5	12.6
	Kildare/West Wicklow	5.0	5.0	7.8	8.4	5.4	7.9	6.9	7.4	14.3	6.9
	Wicklow	5.0	8.0	1.0	5.0	2.7	5.5	7.3	2.7	5.5	10.1
HSE-M	**Total**	**7.1**	**3.1**	**8.4**	**5.3**	**3.6**	**6.4**	**6.0**	**6.4**	**9.5**	**9.9**
	Longford/Westmeath	8.7	6.8	7.8	7.8	4.4	8.8	5.3	6.2	14.1	9.7
	Laois/Offaly	5.7	0.0	9.0	3.3	2.9	4.4	6.5	6.5	5.8	10.2
HSE-MW	**Total**	**13.8**	**7.1**	**9.7**	**12.1**	**12.2**	**14.7**	**10.2**	**8.3**	**6.9**	**7.5**
	Clare	11.6	5.8	9.7	6.8	10.8	19.8	8.1	7.2	3.6	7.2
	Limerick	na	na	na	na	11.9	13.2	14.5	9.3	11.2	10.6
	Tipp Nth/East Limerick	na	na	na	na	14.2	11.1	6.1	8.1	4.0	3.0
HSE-NE	**Total**	**6.1**	**11.0**	**7.0**	**7.5**	**5.8**	**3.3**	**8.4**	**6.1**	**4.6**	**6.9**
	Cavan/Monaghan	2.8	14.8	5.6	9.3	5.1	6.7	8.4	5.1	6.7	6.7
	Louth/South Monaghan	12.8	9.8	11.8	10.8	8.1	1.8	7.2	8.1	5.4	6.3
	Meath	3.7	9.0	4.5	3.7	4.9	1.8	9.2	5.5	2.5	7.4
HSE-NW	**Total**	**4.1**	**5.9**	**5.4**	**4.1**	**6.7**	**6.3**	**3.8**	**7.2**	**5.9**	**10.5**
	Donegal	2.9	3.6	4.4	2.9	6.8	4.1	2.7	6.8	4.8	8.8
	Sligo/Leitrim	5.9	9.4	7.0	5.9	6.6	9.9	5.5	7.7	7.7	13.2
HSE-SE	**Total**	**9.7**	**4.7**	**11.6**	**8.3**	**7.4**	**8.0**	**11.1**	**6.3**	**6.5**	**8.0**
	Carlow/Kilkenny	13.5	8.1	10.8	9.0	7.5	6.6	7.5	5.8	5.0	4.1
	Tipperary South	10.7	2.4	4.7	9.5	7.9	13.6	20.4	9.0	6.8	10.2
	Waterford	12.6	7.2	23.3	11.7	13.3	9.2	13.3	8.3	9.2	15.8
	Wexford	2.6	0.9	6.0	3.4	1.5	4.6	6.1	3.0	5.3	3.0
HSE-S	**Total**	**13.8**	**12.4**	**13.3**	**16.0**	**12.6**	**12.2**	**15.3**	**16.4**	**14.0**	**13.2**
	Kerry	8.3	6.8	10.6	12.1	10.0	6.4	6.4	6.4	7.2	5.7
	North Cork	21.8	9.5	15.0	10.9	12.4	6.2	8.7	7.4	8.7	14.9
	North Lee	16.7	21.8	18.6	22.4	14.9	21.5	28.0	19.7	22.1	14.9
	South Lee	10.7	10.7	12.5	19.7	11.2	11.7	16.2	30.1	15.6	17.3
	West Cork	13.8	7.9	3.9	2.0	7.5	9.3	5.6	0.0	9.3	11.2
HSE-W	**Total**	**10.0**	**8.9**	**8.7**	**6.0**	**10.4**	**10.9**	**7.7**	**10.6**	**7.5**	**5.1**
	Galway	10.5	10.0	5.7	5.3	9.5	11.2	8.2	13.4	7.8	6.9
	Mayo	8.5	4.3	9.4	8.5	7.3	9.7	7.3	4.8	6.5	2.4
	Roscommon	11.2	14.9	18.6	3.7	20.4	11.9	6.8	11.9	8.5	3.4
Ireland		**10.1**	**9.7**	**10.5**	**10.4**	**10.2**	**10.6**	**10.9**	**11.3**	**11.0**	**11.3**

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

Table 10: TB 3 year moving average rates (per 100,000 population) by local health office[‡‡], 2002-2008

HSE area	LHO	2001	2002	2003	2004	2005	2006	2007	2008
HSE-E	**Total**	**11.6**	**11.9**	**12.0**	**12.6**	**12.8**	**13.2**	**14.5**	**15.5**
1	Dublin South	3.7	4.1	5.9	6.9	5.7	5.9	6.9	6.3
2	Dublin South East	8.3	7.6	8.4	8.7	7.5	7.0	10.2	12.4
3	Dublin South City	20.3	23.0	22.6	22.3	20.7	22.1	27.2	27.7
4	Dublin South West	7.7	8.4	9.1	9.7	9.5	9.5	10.5	11.7
5	Dublin West	12.7	16.5	19.2	19.5	18.8	17.7	19.8	23.1
6	Dublin North West	19.3	20.6	17.7	15.7	18.2	21.5	23.0	23.8
7	Dublin North Central	23.3	21.6	22.0	24.7	25.1	24.9	24.5	24.1
8	Dublin North	9.9	6.9	6.7	9.6	10.8	10.5	9.6	10.0
9	Kildare/West Wicklow	5.7	7.3	7.5	6.8	7.0	7.3	9.0	10.7
10	Wicklow	5.5	3.8	3.4	4.0	5.3	5.7	4.6	6.0
HSE-M	**Total**	**5.4**	**6.3**	**5.7**	**4.7**	**5.6**	**6.2**	**7.1**	**8.8**
	Longford/Westmeath	7.5	7.5	6.9	6.3	6.8	6.4	7.9	11.0
	Laois/Offaly	3.7	5.3	4.6	3.4	4.5	6.0	6.3	7.1
HSE-MW	**Total**	**9.4**	**9.6**	**11.5**	**12.8**	**12.9**	**10.9**	**8.4**	**7.4**
	Clare	8.2	8.0	8.5	12.1	14.6	10.8	6.5	5.4
	Limerick[§§]	na	na	na	12.8	13.2	12.9	11.1	10.6
	Tipp Nth/East Limerick**	na	na	na	13.5	10.6	7.8	6.6	4.8
HSE-NE	**Total**	**8.8**	**8.1**	**7.0**	**5.6**	**5.2**	**6.5**	**6.3**	**5.5**
	Cavan/Monaghan	9.5	8.8	7.3	6.5	6.7	7.2	6.3	6.3
	Louth/South Monaghan	11.0	11.0	10.4	7.2	4.7	6.1	7.2	6.3
	Meath	6.5	5.4	4.2	3.8	4.5	6.4	5.7	4.5
HSE-NW	**Total**	**5.3**	**5.2**	**5.1**	**6.0**	**5.8**	**5.3**	**6.0**	**7.4**
	Donegal	3.6	3.8	4.2	5.1	4.4	4.1	5.3	6.3
	Sligo/Leitrim	7.9	7.3	6.3	7.2	8.0	7.1	7.1	9.1
HSE-SE	**Total**	**7.7**	**9.0**	**8.9**	**7.8**	**8.6**	**9.1**	**7.5**	**6.8**
	Carlow/Kilkenny	10.1	9.7	9.1	7.6	7.0	6.8	6.0	5.0
	Tipperary South	5.0	5.3	7.9	9.7	13.9	15.8	11.3	8.2
	Waterford	12.6	16.4	15.0	11.9	11.2	11.0	9.8	10.6
	Wexford	2.6	4.1	3.6	2.8	4.2	4.9	4.4	4.2
HSE-S	**Total**	**13.0**	**13.7**	**14.5**	**13.4**	**13.1**	**14.8**	**15.5**	**14.4**
	Kerry	8.1	10.0	11.2	9.6	7.3	6.4	6.6	6.6
	North Cork	13.9	12.6	12.3	10.5	8.4	7.7	8.0	9.9
	North Lee	19.7	20.3	19.6	18.4	21.5	24.3	22.4	19.7
	South Lee	11.2	13.9	15.8	13.4	12.7	18.5	23.0	19.7
	West Cork	8.4	4.4	3.8	6.6	7.9	5.1	3.7	7.5
HSE-W	**Total**	**9.1**	**8.1**	**7.8**	**9.4**	**10.0**	**9.2**	**9.1**	**7.7**
	Galway	6.7	6.4	8.9	10.0	10.3	10.7	9.0	7.0
	Mayo	7.9	8.4	8.2	8.5	7.3	5.9	5.0	3.6
	Roscommon	13.9	11.6	14.1	12.8	9.4	9.8	8.1	4.7
Ireland		**10.0**	**10.3**	**10.4**	**10.3**	**10.6**	**10.9**	**11.2**	**11.2**

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

[§§] Rates cannot be calculated for these LHOs as the population in the LHO was not known prior to 2006 Census

Geographic origin

Of the 479 patients diagnosed with TB in 2009, 270 (56.4%) were born in Ireland, 206 (43.0%) were born outside Ireland and for the remaining three cases (0.6%), the country of birth was unknown. The crude TB rate in the indigenous population was 7.6 per 100,000 population while the crude rate in the foreign-born population was 33.6 per 100,000 population.

Figure 7 shows TB cases and rate per 100,000 population by geographic origin, compared to the national rate from 1998 to 2009.

Table 11 shows the breakdown of TB cases by HSE area and geographic origin.

Cases born outside Ireland originated from at least 38 countries. Table 12 shows the breakdown of these cases by country of birth and corresponding continent. Of the 206 cases born outside Ireland, 40.8% were born in Asia, 30.1% were born in Africa, 17.0% were born in Europe and 1.5% in America. The exact country of birth was unknown for 22 cases (10.7%).

Figure 8 shows age-specific rates by geographic origin during 2009. The majority (81.6%) of cases born outside Ireland were aged between 15 and 44 years compared to 33.7% of Irish cases in this age range. The median age among foreign-born cases was 32 years (range: 3-67 years) compared to a median age of 53 years (range: 0-91 years) among Irish born cases.

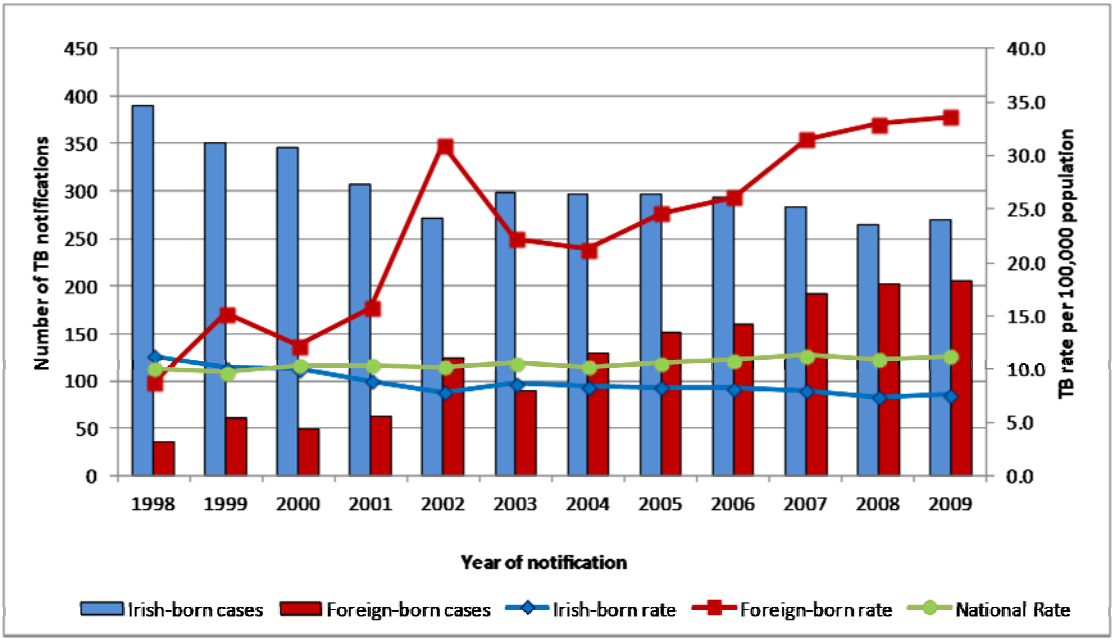

Figure 7: TB cases and rate per 100,000 by geographic origin, 1998-2009

Table 11: TB cases and rates per 100,000 population by HSE area and geographic origin, 2009

HSE Area	Irish-born			Foreign-born			Unknown	Total
	Cases	%	Rate	Cases	%	Rate		
HSE-E	102	43.4	8.3	130	55.3	53.9	3	**235**
HSE-M	14	56.0	6.4	11	44.0	36.3	0	**25**
HSE-MW	16	59.3	5.2	11	40.7	24.6	0	**27**
HSE-NE	16	59.3	4.8	11	40.7	19.0	0	**27**
HSE-NW	18	72.0	9.3	7	28.0	17.1	0	**25**
HSE-SE	24	64.9	6.0	13	35.1	24.5	0	**37**
HSE-S	68	82.9	12.9	14	17.1	17.3	0	**82**
HSE-W	12	57.1	3.5	9	42.9	14.2	0	**21**
Ireland	**270**	**56.4**	**7.6**	**206**	**43.0**	**33.6**	**3**	**479**

Table 12: Countries of origin of foreign-born patients with TB, 2009

Continent	Total	Country	Number of cases
Africa	62	Algeria	2
		Angola	3
		Botswana	1
		Cameroon	3
		Congo	5
		Eritrea	3
		Kenya	4
		Morocco	1
		Nigeria	11
		Somalia	17
		South Africa	6
		Sudan	6
America	3	Brazil	2
		Venezuela	1
Asia	84	Bangladesh	1
		China	4
		Hong Kong	1
		India	30
		Iran, Islamic Republic of	1
		Malaysia	1
		Nepal	1
		Pakistan	32
		Philippines	11
		Sri Lanka	1
		Viet Nam	1
Europe	35	Azerbaijan	1
		Belgium	1
		Bulgaria	1
		Croatia	1
		Finland	1
		Georgia	1
		Latvia	2
		Lithuania	4
		Poland	5
		Romania	10
		Russian Federation	1
		Spain	1
		United Kingdom	6
Unknown	22	Unknown - Indian Sub-continent	1
		Unknown - Not Ireland	17
		Unknown - Sub-Saharan Africa	4
Total			**206**

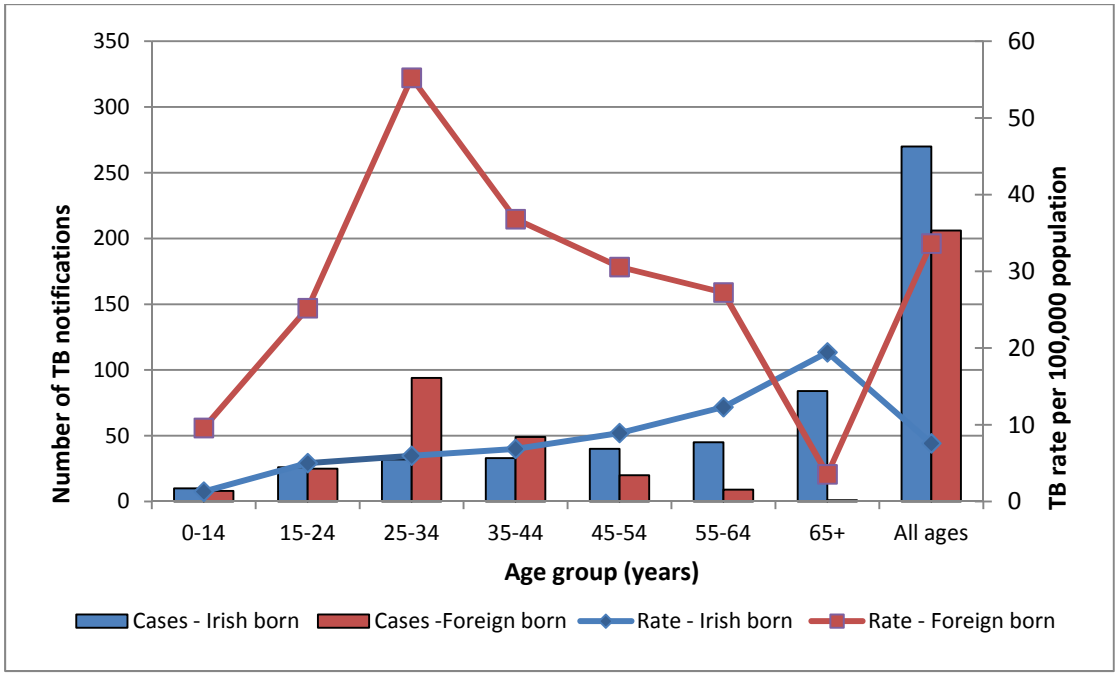

Figure 8: TB cases by age group (years) and age-specific rates by geographic origin, 2009

Site of disease

Of the 479 cases notified in 2009, 288 (60.3%) were pulmonary, 164 (34.3%) were extrapulmonary, 26 (5.4%) were pulmonary and extrapulmonary and site of disease was not reported for the remaining case (0.2%). 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, 2009

HSE area	Pulmonary only		Extrapulmonary only		Pulmonary + Extrapulmonary	
	Cases	% of total	Cases	% of total	Cases	% of total
HSE-E	143	*60.9*	80	*34.0*	12	*5.1*
HSE-M	10	*40.0*	11	*44.0*	4	*16.0*
HSE-MW	13	*48.1*	12	*44.4*	2	*7.4*
HSE-NE	19	*70.4*	7	*25.9*	1	*3.7*
HSE-NW	12	*48.0*	13	*52.0*	0	*0.0*
HSE-SE	22	*59.5*	14	*37.8*	1	*2.7*
HSE-S***	56	*69.1*	22	*27.2*	3	*3.7*
HSE-W	13	*61.9*	5	*23.8*	3	*14.3*
Total	**288**	***60.3***	**164**	***34.3***	**26**	***5.4***

*** 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 314 cases reported in 2009 with a pulmonary disease component (65.6% of all cases reported). Sputum smear and culture results for these cases are shown in table 14. Sputum microscopy results were available for 236 (75.2%) of the 314 cases. This is a slight increase compared to 2008 (72.1%) and 2007 (71.3%) but is a decrease compared to the figures from 2002-2005 (range 83.7-79.6%).

Of the 314 pulmonary cases, 139 (44.3%) were sputum positive for AFB by microscopy and 243 (77.4%) were culture positive. This compares to 46.9% positive for AFB by microscopy and 72.7% culture positive in 2008. The proportion of pulmonary cases (with or without an extrapulmonary site) was higher in persons born in Ireland (73.7%) compared to those born abroad (54.4%).

Table 14: Sputum smear and culture status for pulmonary TB cases, 2009

Culture result	Sputum smear positive	Sputum smear negative	Sputum smear not done	Sputum smear unknown	Total
Culture positive	129	68	42	4	**243**
Culture negative	6	27	11	6	**50**
Culture not done	2	2	8	3	**15**
Culture not known	2	0	1	3	**6**
Total	**139**	**97**	**62**	**16**	**314**

Extra-pulmonary TB cases

One hundred and sixty-four cases (34.2%) had exclusively extrapulmonary TB of whom 98 (59.8%) were culture confirmed and fifty-one (31.1%) were histology positive.

One hundred and ninety (39.7%) of all cases reported in 2009 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 (26.8%) and pleura (23.7%). There were eight cases (4.2% of extrapulmonary cases) of TB meningitis in 2009.

Table 15: Extrapulmonary disease sites in notified cases, 2009[†††]

Site of disease	Number of cases	Percentage
Lymph (extra-thoracic)	51	26.8
Pleural	45	23.7
Other	30	15.8
Lymph (intra-thoracic)	18	9.5
Spinal	12	6.3
Peritoneal	9	4.7
Meningeal	8	4.2
Disseminated	7	3.7
Bone	6	3.2
Unknown	2	1.1
CNS	1	0.5
Genitourinary	1	0.5
Total	**190**	**100.0**

TB meningitis

There were eight cases of TB meningitis reported in 2009 giving an incidence rate of 0.19 per 100,000 population (1.9 per million population). A profile of these cases is provided in table 16. Of the eight cases, seven were diagnosed as extrapulmonary and one was diagnosed as pulmonary and extrapulmonary. Four of the TB meningitis cases were reported as culture confirmed.

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

Table 16: TB meningitis cases in Ireland, 2009

HSE area	Age group (years)	History of BCG	Culture status
HSE-E	0-4	Y	Negative
HSE-E	25-34	Y	Positive
HSE -MW	25-34	N	Positive
HSE -NE	35-44	Unk	Positive
HSE -NW	55-64	Y	Positive
HSE -SE	65+	Yes	Negative
HSE -S	0-4	Y	Negative
HSE -S	45-54	Y	Negative

Between 1998 and 2009, a total of 77 cases of TB meningitis have been reported (figure 9). The cumulative incidence rates of TB meningitis in each HSE area and in Ireland for 1998-2009 are shown in table 17. The highest cumulative rate of TB meningitis between 1998 and 2009 is in HSE South (3.5 per 100,000).

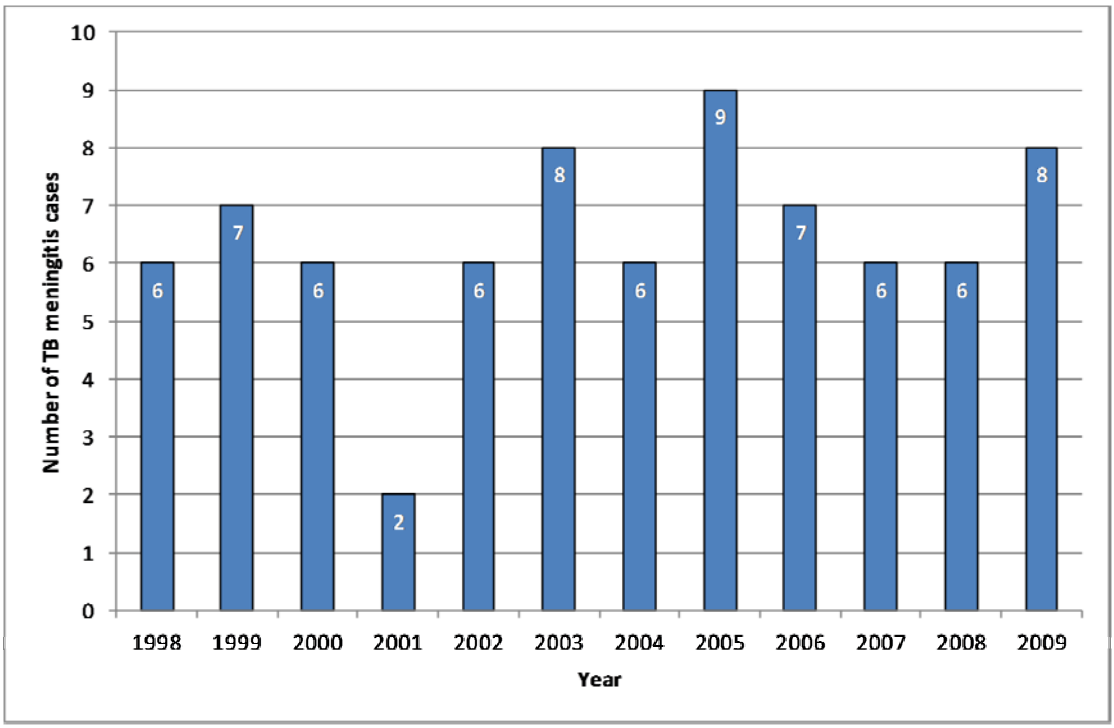

Figure 9: Number of TB meningitis cases, 1998-2009

Table 17: Cumulative incidence rate of TB meningitis in Ireland, 1998-2009

HSE area	Cases 1998 to 2009	Cumulative incidence rate (per 100,000)	95% CI
HSE-E	26	1.7	1.1 - 2.4
HSE-M	0	0.0	0 - 0
HSE-MW	6	1.7	0.3 - 3
HSE-NE	8	2.0	0.6 - 3.4
HSE-NW	4	1.7	0 - 3.3
HSE-SE	6	1.3	0.3 - 2.3
HSE-S	22	3.5	2.1 - 5
HSE-W	5	1.2	0.1 - 2.3
Ireland	**77**	**1.8**	**1.4 - 2.2**

Note: Calculations based on 2006 census figures

The highest cumulative age specific rates of TB meningitis between 1998 and 2009 were reported in the 25-34 year age group (2.8/100,000) followed by the 0-4 year age group (2.3/100,000) while the lowest rates were reported in the 45-54 year age group (0.4/100,000) and the 5-9 year age group (1.0/100,000). Figure 10 shows the number of TB meningitis cases by age group and cumulative age specific rate between 1998 and 2009.

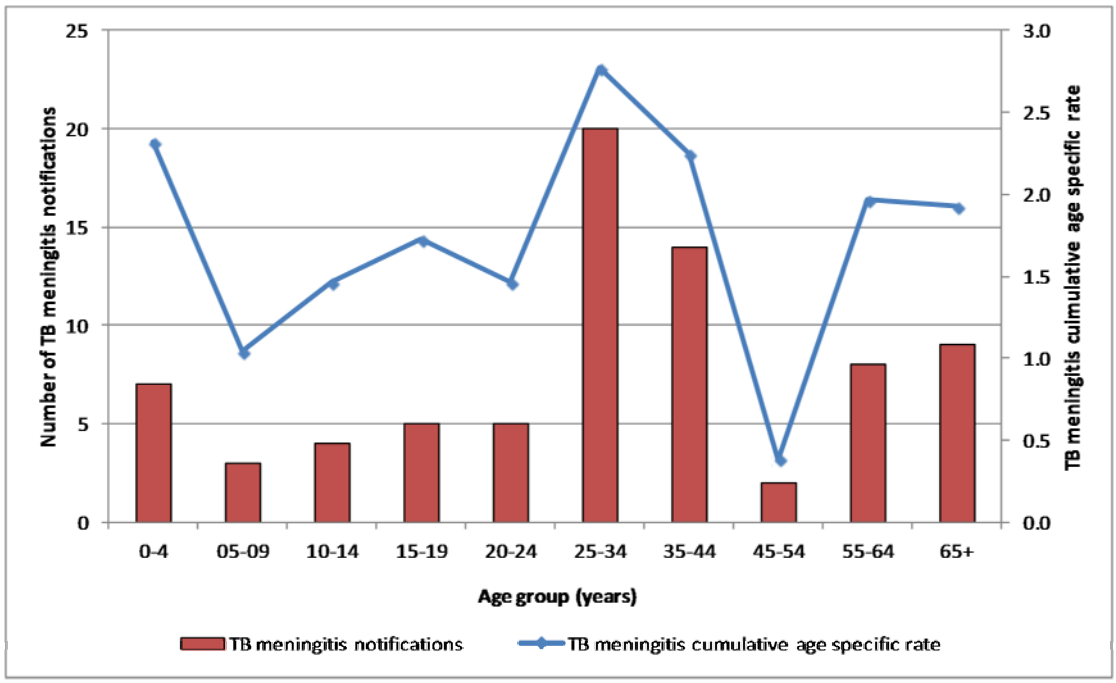

Figure 10: Cumulative number of TB meningitis notifications by age group and cumulative age specific rate, 1998-2009

Bacteriological results

Of the 479 cases notified in 2009, 376 (78.5%) were laboratory confirmed by culture, microscopy or histology.

Of the 314 cases with a pulmonary component, 260 (82.8%) were laboratory confirmed (by culture, microscopy or histology) and of the 164 cases with exclusively extrapulmonary disease, 116 (70.7%) were laboratory confirmed (by culture, microscopy or histology).

Culture

In 2009, 341 (71.2%) of all TB cases notified were culture positive. This is an increase on the percentage reported in 2008 (66.8%). Table 18 shows a breakdown by culture status and HSE area of TB cases notified in 2009 while figure 11 shows the number of TB notifications and percentage culture positive by year, 2002 to 2009.

Of the 314 cases with a pulmonary component, 243 (77.4%) were culture confirmed, an increase from 72.7% reported in 2008. For new[‡‡‡] cases with a pulmonary component, 189 (80.1%) were culture confirmed, an increase compared to 75.0% reported in 2008.

Of the 164 cases with exclusive extrapulmonary disease, 98 (59.8%) were culture confirmed, an increase compared to 51.9% reported in 2008.

Table 18: Culture status of TB cases by HSE area, 2009

HSE area	Positive	Negative	Not done	Unknown	Total
HSE-E	158	53	16	8	**235**
HSE-M	21	3	1	0	**25**
HSE-MW	21	4	1	1	**27**
HSE-NE	20	3	0	4	**27**
HSE-NW	24	1	0	0	**25**
HSE-SE	25	9	3	0	**37**
HSE-S	56	18	8	0	**82**
HSE-W	16	3	2	0	**21**
Ireland	**341**	**94**	**31**	**13**	**479**

[‡‡‡] "New" cases are defined as cases where previous history of TB was reported as "No"

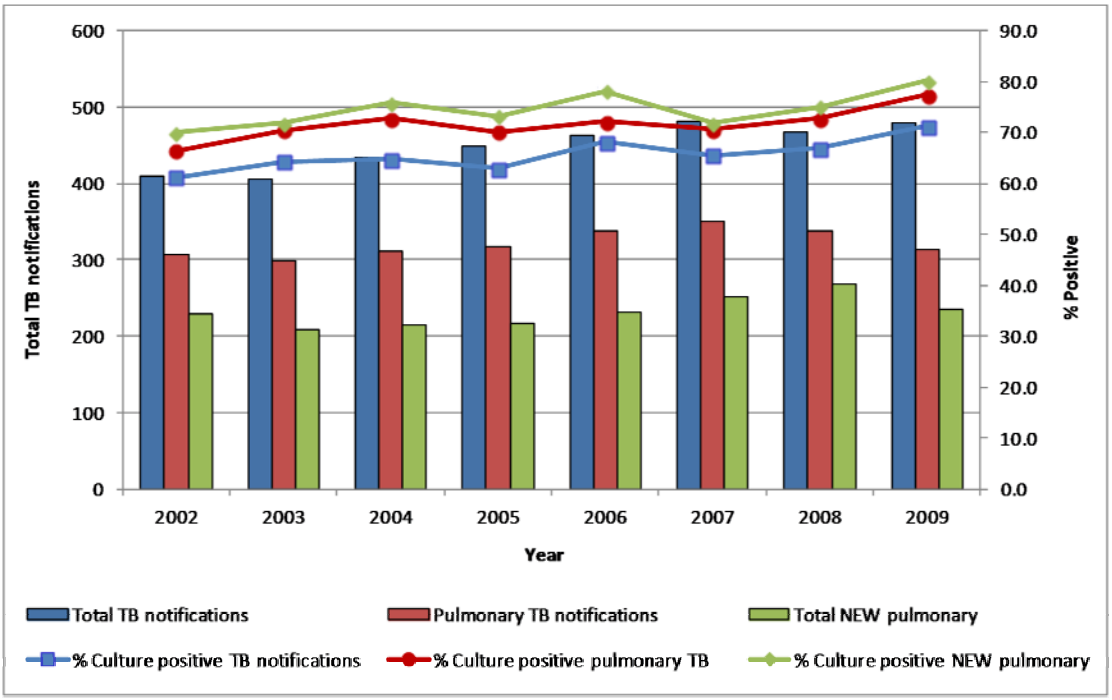

Figure 11: Number of TB notifications and percentage culture positive by year, 2002-2009

Species

Information on species was reported for 337 (98.8%) of the 341 culture confirmed cases. Of the cases where species was reported, 328 (97.3%) were *M. tuberculosis*, eight (2.4%) were *M. bovis* and one (0.3%) was *M. africanum.* Table 19 shows the number and percentage of culture positive TB cases by species and year.

Table 19: Number and percentage of culture positive TB notifications by species 2002-2009

Year	*M. africanum*		*M. bovis*		*M. tuberculosis*		Species Unk	
	N	%	N	%	N	%	N	%
2002	1	*0.4*	6	*2.4*	234	*93.2*	10	*4.0*
2003	1	*0.4*	3	*1.1*	250	*95.8*	7	*2.7*
2004	0	*0.0*	5	*1.8*	269	*96.1*	6	*2.1*
2005	1	*0.4*	4	*1.4*	274	*97.2*	3	*1.1*
2006	1	*0.3*	5	*1.6*	307	*97.5*	2	*0.6*
2007	2	*0.6*	6	*1.9*	305	*96.8*	2	*0.6*
2008	0	*0.0*	12	*3.8*	295	*94.6*	5	*1.6*
2009	1	*0.3*	8	*2.3*	328	*96.2*	4	*1.2*
Total	**7**	***0.3***	**49**	***2.1***	**2262**	***96.0***	**39**	***1.7***

Anti-TB drug resistance[§§§]

Information on the results of drug sensitivity testing (DST) was reported for 323 (94.7%) of the 341 culture confirmed cases, which remains stable in comparison to the proportion reported in 2008 (95.2%). The proportion of culture confirmed cases with DST results reported was 97.0% for new pulmonary cases and 90.9% for cases with a previous history of TB. Table 20 shows the percentage of culture positive TB notifications with DST results available by previous history of TB and year.

Table 20: Percentage of culture positive TB notifications with DST results available by previous history of TB and year 2002-2009

Year	% Culture pos with DST results – Total notifications	% Culture pos with DST results - New pulmonary	% Culture pos with DST results - Previous history of TB reported	% Culture pos with DST results - Previous TB treatment reported
2002	93.6	95.6	89.5	90.9
2003	96.6	97.3	96.2	100.0
2004	93.9	96.3	83.3	90.0
2005	96.5	97.5	100.0	100.0
2006	93.7	96.7	85.7	92.3
2007	93.7	92.8	100.0	100.0
2008	95.2	97.0	95.5	83.3
2009	94.7	94.7	90.9	91.3
Mean	**94.7**	**96.0**	**92.6**	**93.5**

Of the 323 cases where sensitivity results were reported, resistance was documented in 26 cases (8.0%; 5.4% of total cases), including one case of MDR-TB (3.8%; 0.2% of total cases). Mono-resistance to isoniazid was recorded in 11 cases (2 *M. bovis*), to pyrazinamide in two cases, to ethambutol in one case, to streptomycin in three cases. Further details of resistant cases are summarised in table 21.

Of the 26 drug resistant cases 18 (69.2%), including the MDR-TB case, were born outside Ireland (figure 12). Nineteen of the 26 drug resistant cases had no previously recorded history of TB, five had a previously documented history of TB while previous TB history was unknown for the remaining two drug resistant cases (figure 13).

A summary of drug resistance in 2009 is shown in table 21 and the drug sensitivity results of the MDR-TB case are shown in table 22 while figure 14 shows the number of MDR notifications, rate per 100,000 population and 3 year moving average by year.
There were no XDR-TB cases reported in Ireland during 2009.

[§§§] Resistance to pyrazinamide has not been reported in *M. bovis* cases as *M. bovis* is innately resistant to pyrazinamide.

Table 21: Summary of drug resistant TB cases in Ireland, 2009

DST results	Number of cases	% of culture confirmed cases
Cases with DST results	323	94.7
Resistant cases	26	7.6
MDR-TB	1	0.3
Mono-resistance to Isoniazid	11	3.2
Mono-resistance to Rifampicin	0	0.0
Mono-resistance to Pyrazinamide	2	0.6
Mono-resistance to Ethambutol	1	0.3
Mono-resistance to Streptomycin	3	0.9
Cases resistant to isoniazid and pyrazinamide	2	0.6
Cases resistant to isoniazid and streptomycin	4	1.2
Cases resistant to isoniazid and ethambutol	1	0.3
Cases resistant to pyrazinamide and streptomycin	1	0.3

Table 22: Sensitivity results of MDR-TB case, 2009

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

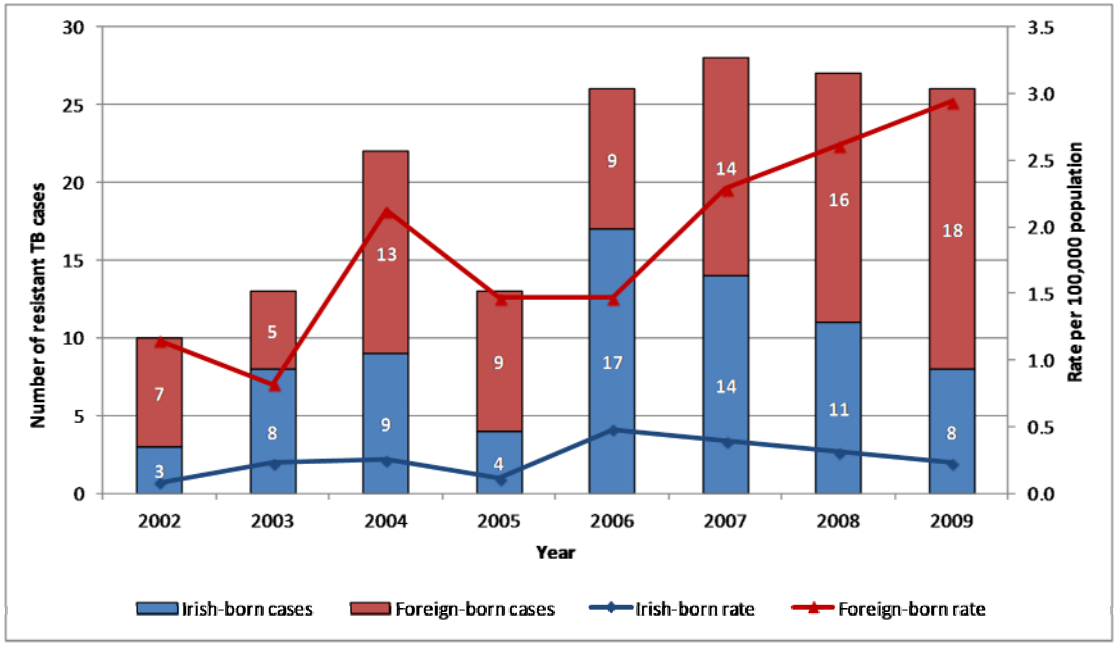

Figure 12: Number and rate of TB notifications with resistance to any first line anti-TB drug by geographic origin and year 2002-2009

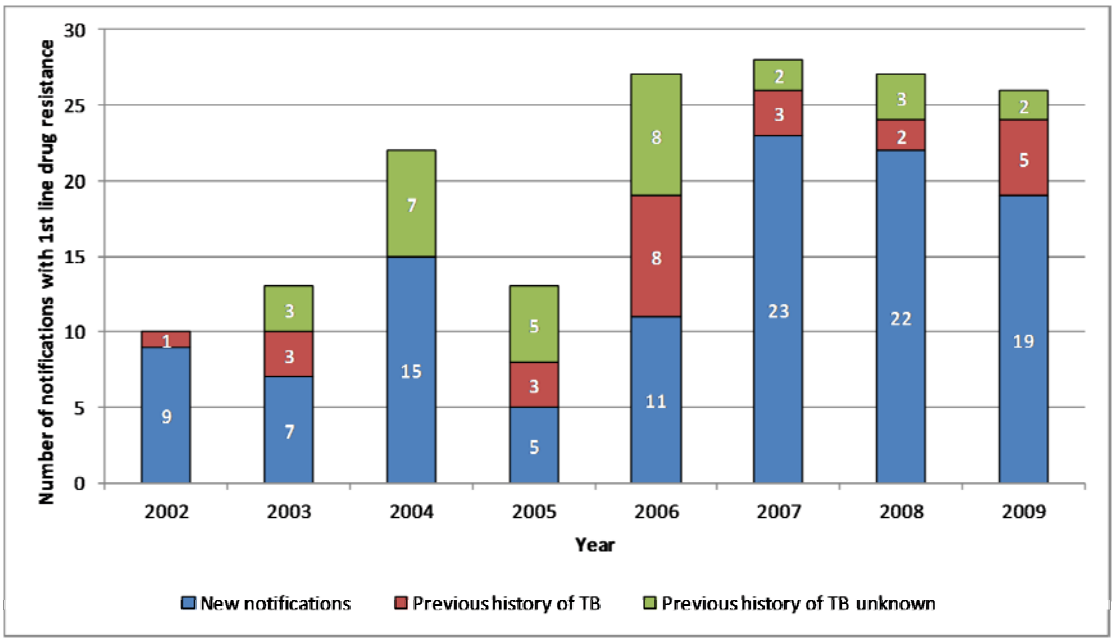

Figure 13: Number of TB notifications with resistance to any first line anti-TB drug by previous history of TB and year

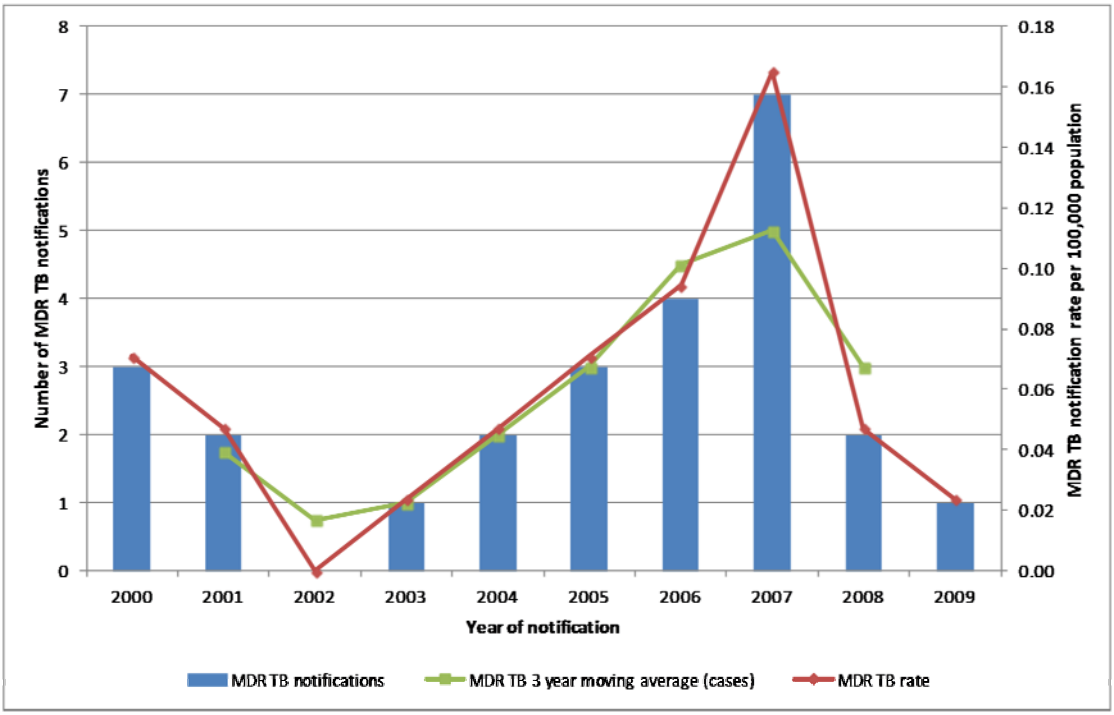

Figure 14: Number of MDR notifications, rate per 100,000 population and 3 year moving average by year

Case classification

Using the case definitions (described in the Methods section), 2009 cases can be classified into confirmed, probable and possible cases as outlined in Table 23. Of the 479 cases, 341 (71.2%) were confirmed, 35 (7.3%) were probable and 103 (21.5%) were possible cases.

Table 23: Case classification of TB cases by site of disease, 2009

Site of disease	Confirmed		Probable		Possible		Total
	Cases	%	Cases	%	Cases	%	
Pulmonary	222	77.1	14	4.9	52	18.1	**288**
Pulmonary + Extrapulmonary	21	80.8	3	11.5	2	7.7	**26**
Extrapulmonary	98	59.8	18	11.0	48	29.3	**164**
Not specified	0	0.0	0	0.0	1	100	**1**
Total	**341**	71.2	**35**	7.3	**103**	21.5	**479**

Treatment outcome

Outcome was recorded for 395 (82.5%) of the 479 cases notified in 2009, a decrease compared to 88.7% in 2008 (figure 15). Of the 395 cases, 307 completed treatment, 34 died, 30 were recorded as being lost to follow up, treatment was interrupted in four cases, one case transferred out and 19 cases were still on treatment at the time of reporting. Of the 34 deaths reported, 10 (2.1% of total cases) were attributed to TB.

Outcome was reported for 122 (87.8%) of the 139 smear positive cases. Of the 122, 100 completed treatment, 15 died, two cases were still on treatment, two were lost to follow up, treatment was interrupted in two cases at the time of reporting and one case transferred out. Of the 15 deaths among smear positive cases, six were attributed to TB.

Details on treatment outcome for all cases and for smear positive cases only are shown in table 24 while treatment outcome by HSE area is shown in table 25.

Of the 26 drug-resistant cases, 17 (65.4%) completed treatment, two died, one case transferred out, two were lost to follow up and treatment outcome was unknown in four cases.

Of the two MDR-TB cases reported in 2008, both died (one not due to TB and one unknown cause). Treatment outcome for the MDR-TB case reported during 2009 is not yet available.

Figure 16 shows TB notifications by treatment success and year while figure 17 shows the number of MDR-TB notifications by treatment outcome and percentage treatment success by year.

Table 24: Treatment outcome for all cases and smear positive cases, 2009

Treatment outcome	Total		Smear Positive	
	Number	%	Number	%
Completed	307	64.1	100	71.9
Lost to follow up	30	6.3	2	1.4
Died (not attributed to TB)	22	4.6	8	5.8
Still on treatment	19	4.0	2	1.4
Died (attributed to TB)	10	2.1	6	4.3
Interrupted (>2mths)	4	0.8	2	1.4
Died (cause unknown)	2	0.4	1	0.7
Transferred	1	0.2	1	0.7
Unknown	84	17.5	17	12.2
Total	**479**	**100.0**	**139**	**100.0**

Table 25: Treatment outcome by HSE area, 2009

		Outcome known	Outcome unknown	Lost to follow up	Total
HSE E	**Number**	158	52	25	**235**
	%	*67.2*	*22.1*	*10.6*	*100.0*
HSE M	**Number**	24	0	1	**25**
	%	*96.0*	*0.0*	*4.0*	*100.0*
HSE MW	**Number**	24	3	0	**27**
	%	*88.9*	*11.1*	*0.0*	*100.0*
HSE NE	**Number**	11	16	0	**27**
	%	*40.7*	*59.3*	*0.0*	*100.0*
HSE NW	**Number**	25	0	0	**25**
	%	*100.0*	*0.0*	*0.0*	*100.0*
HSE SE	**Number**	36	0	1	**37**
	%	*97.3*	*0.0*	*2.7*	*100.0*
HSE S	**Number**	69	12	1	**82**
	%	*84.1*	*14.6*	*1.2*	*100.0*
HSE W	**Number**	18	1	2	**21**
	%	*85.7*	*4.8*	*9.5*	*100.0*
National	**Number**	**365**	**84**	**30**	**479**
	%	***76.2***	***17.5***	***6.3***	***100.0***

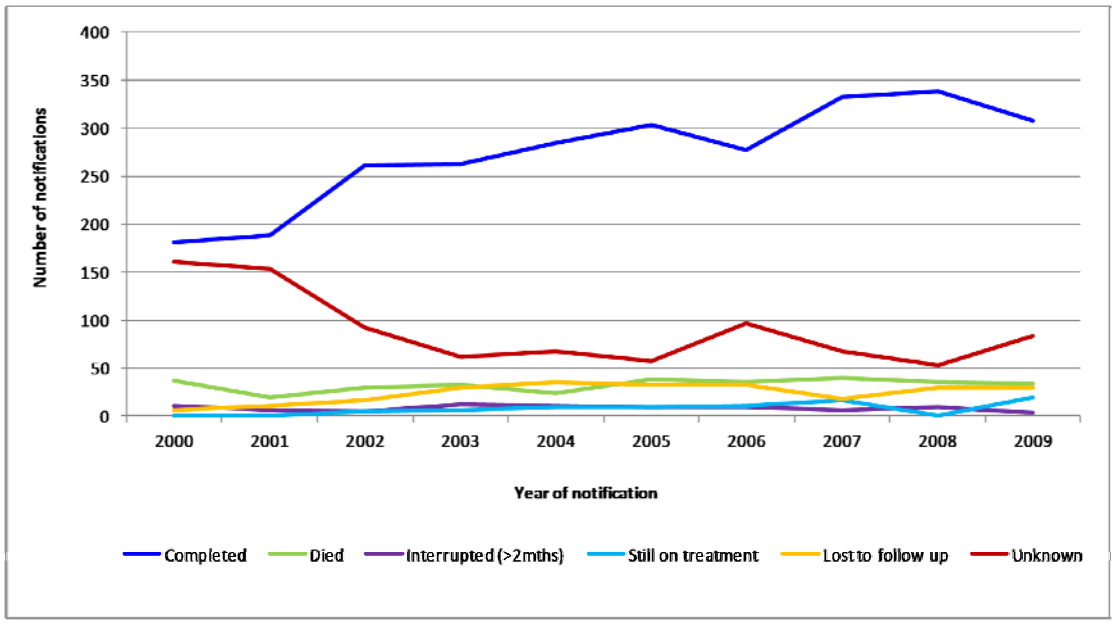

Figure 15: TB notifications by treatment outcome and year 2000-2009

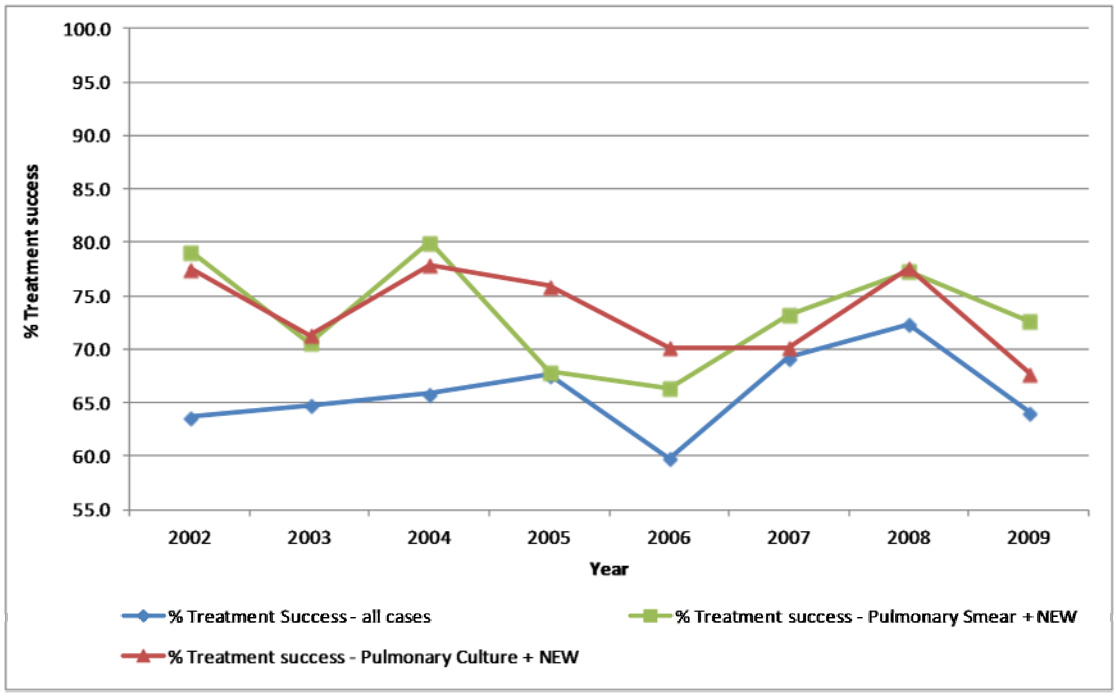

Figure 16: TB notifications by treatment success and year 2002-2009

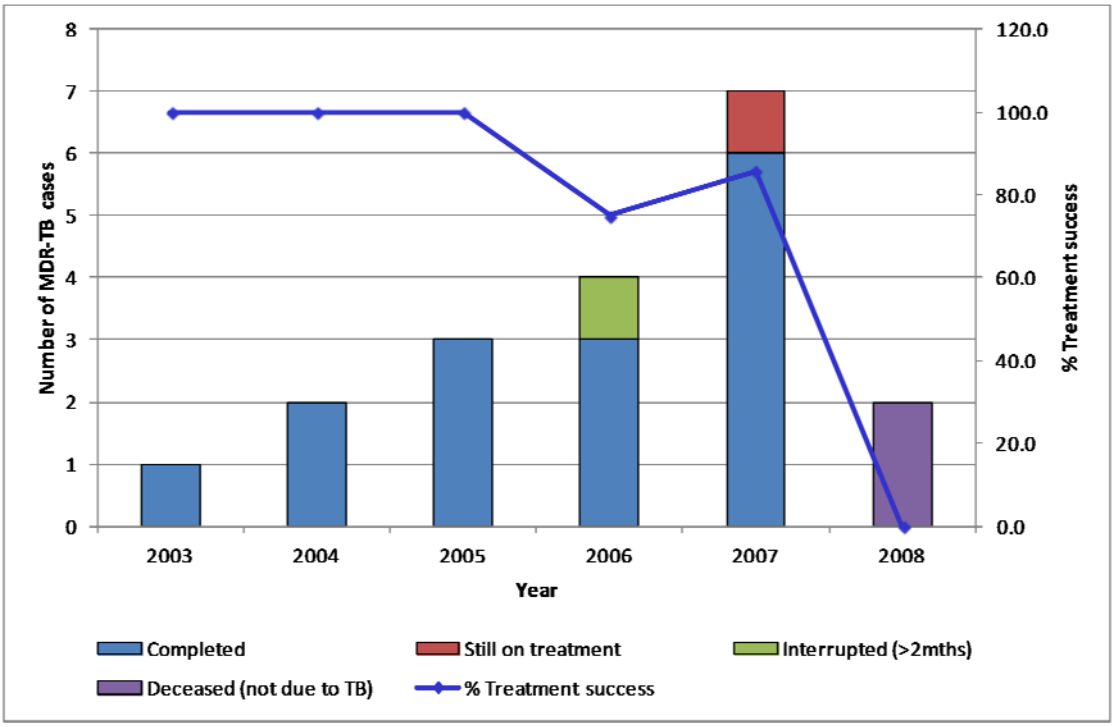

Figure 17: Number of MDR-TB notifications by treatment outcome and percentage treatment success by year

Case ascertainment

Table 26 summarises the method by which cases notified in 2009 were found. The majority (77.9%) presented as a case with a further 6.9% found by contact tracing.

Table 26: Method of case finding, 2009

Case found by	Number of cases	Percentage
Presenting as case	373	77.9
Contact tracing	33	6.9
Other	23	4.8
Other screening	10	2.1
Immigrant screening	2	0.4
Unknown	38	7.9
Total	**479**	**100.0**

Previous history of TB

Fifty-two (10.9%) of the 479 cases were reported to have a previous history of TB. The previous year of diagnosis was provided for 42 cases and ranged from 1940 to 2009 with 30 of the 42 cases (71.4%) reported to have had TB in the previous ten years.

Of the 52 cases with a previous history of TB, 33 reported having been treated for TB and one case reported not being treated for TB. Previous year of diagnosis for two cases was prior to the introduction of TB medication and previous treatment was unknown for the remaining 16 cases.

Of the 33 cases who were previously treated for TB, 21 cases (63.6%) were reported as having completed treatment, two (6.1%) failed treatment, two (6.1%) did not complete treatment and previous treatment outcome was not reported for the remaining eight cases (24.2%).

Figure 18 shows the number of TB notifications by previous history of TB disease and year.

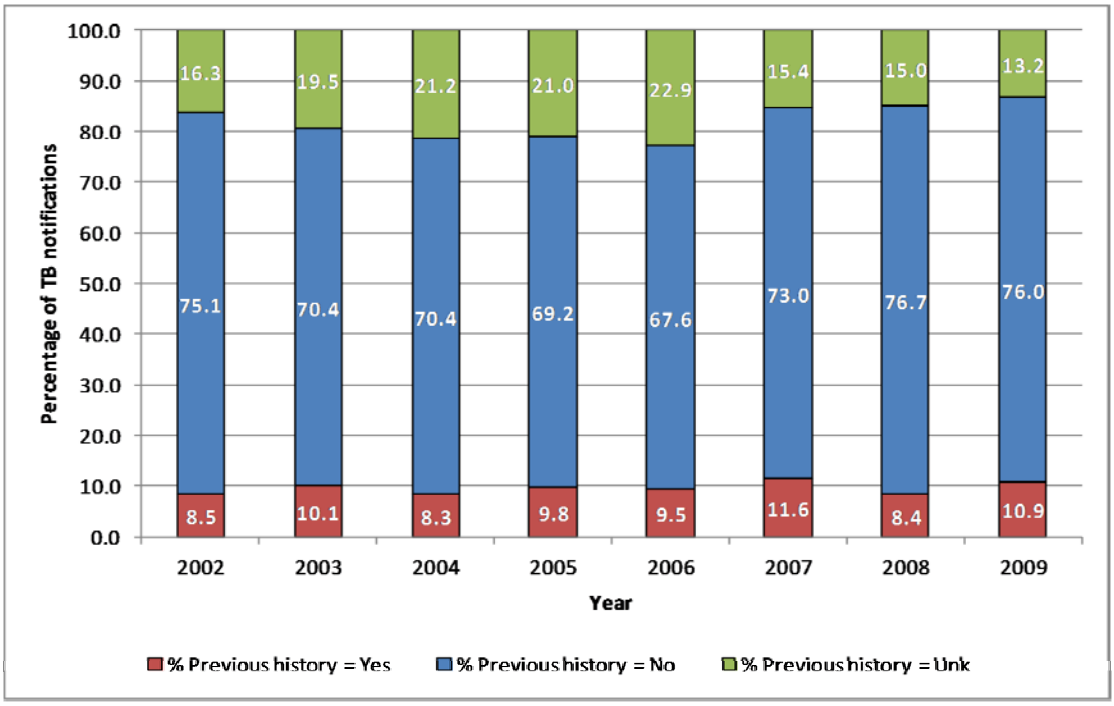

Figure 18: TB notifications by previous history of TB disease and year 2002-2009

TB Risk groups

During 2009, information on TB risk factors was reported for 390 (81.4%) cases a slight increase on the proportion reported in 2008 (79.0%). Of the 390 cases, 153 (39.2%) were reported as not having a risk factor for TB while 237 (60.8%) were reported as having one or more risk factors for TB. The most commonly reported risk factors were being from a country of high TB endemicity (n=98, 41.4%), followed by substance misuse (n=38, 16.0%), contact with a case of TB (n=24, 10.1%) and co-morbidity with an immunosuppressive illness (n=21, 8.9%). Other risk factors reported included treatment with immunosuppressive medication (n=7, 3.0%), co-morbidity with diabetes (n=2, 0.8%) and treatment with anti-TNF medications (n=2, 0.8%). A further 63 (26.6%) cases reported other or unspecified TB risk factors. Other TB risk factors reported included various co-morbidities (including malignancies, respiratory illness and auto-immune disorders), tobacco use, homelessness, previous history of TB and travel to areas of high endemicity.

Figure 19 shows the breakdown of TB cases with a reported risk factor by type of risk factor and year.

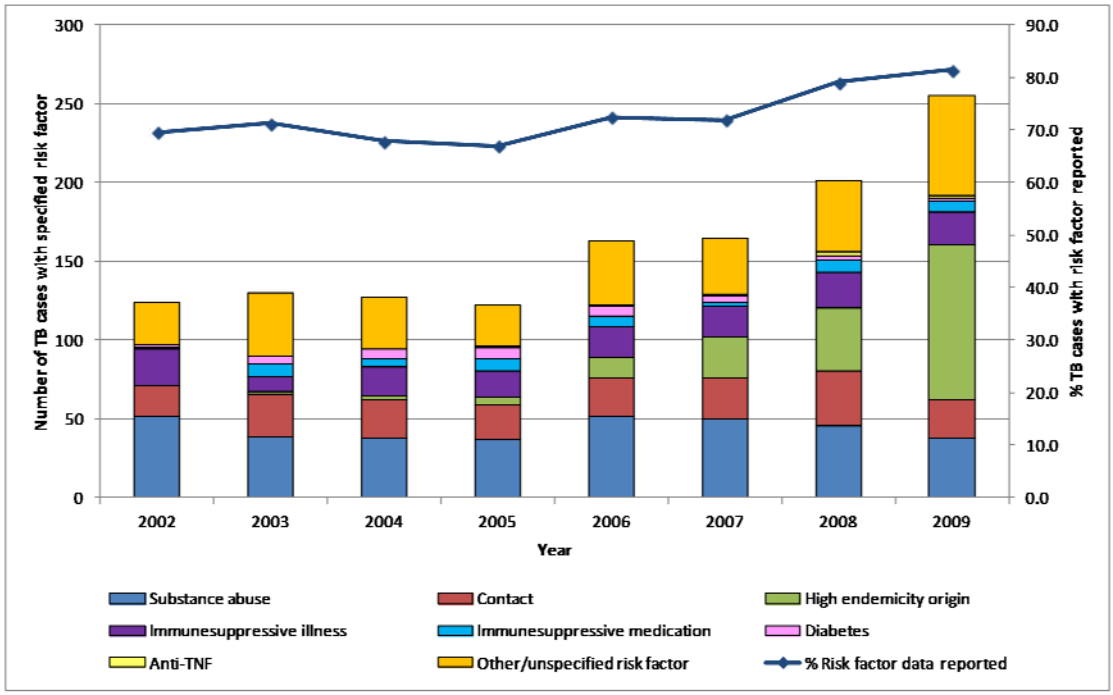

Figure 19: Number of TB notifications with a TB risk factor reported and percentage of TB cases with risk factor data reported, 2002-2009

HIV status

Eleven of the 479 cases (2.3%) notified in 2009 were reported as HIV positive while 125 (26.1%) were reported as HIV negative. Information on HIV status was not reported or was unknown for 343 (71.6%) of cases during 2009, a decrease from 81.6% of cases with HIV status unknown in 2008 (Figure 20).

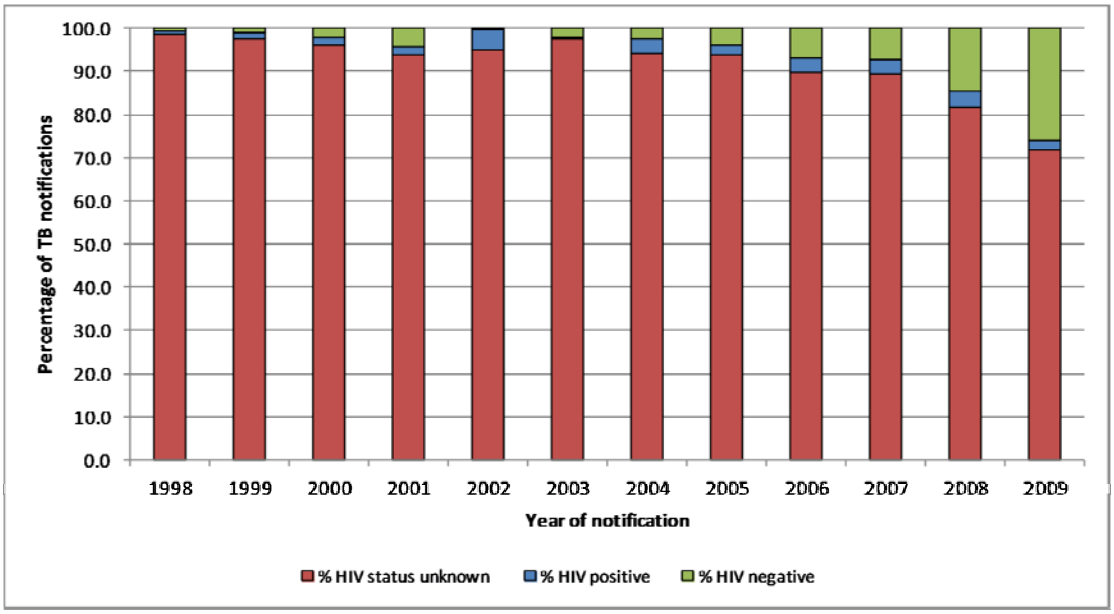

Figure 20: Percentage of TB notifications by HIV status and year, 1998-2009

Outbreaks:

The introduction of the amendment to the Infectious Disease Regulations 1981 on January 1st 2004, made outbreaks, unusual clusters or changing patterns of illness statutorily notifiable by medical practitioners and clinical directors of laboratories to the medical officer of health. Standard reporting procedures for surveillance of TB outbreaks were formally agreed in 2007.

During 2009, nine outbreaks of TB were reported to HPSC, with 28 associated active cases of TB, 53 cases of latent TB infection (LTBI), 16 hospitalisations and two deaths (figure 21). Three outbreaks were reported by HSE-E, three by HSE-S, two by HSE-SE and one by HSE-W (figure 22).

There were five general outbreaks during 2009, three of which occurred in community settings, one was in a residential institution and one was in a day care facility. There were also four family outbreaks, two of which occurred across an extended family and two were in private houses (figure 23).

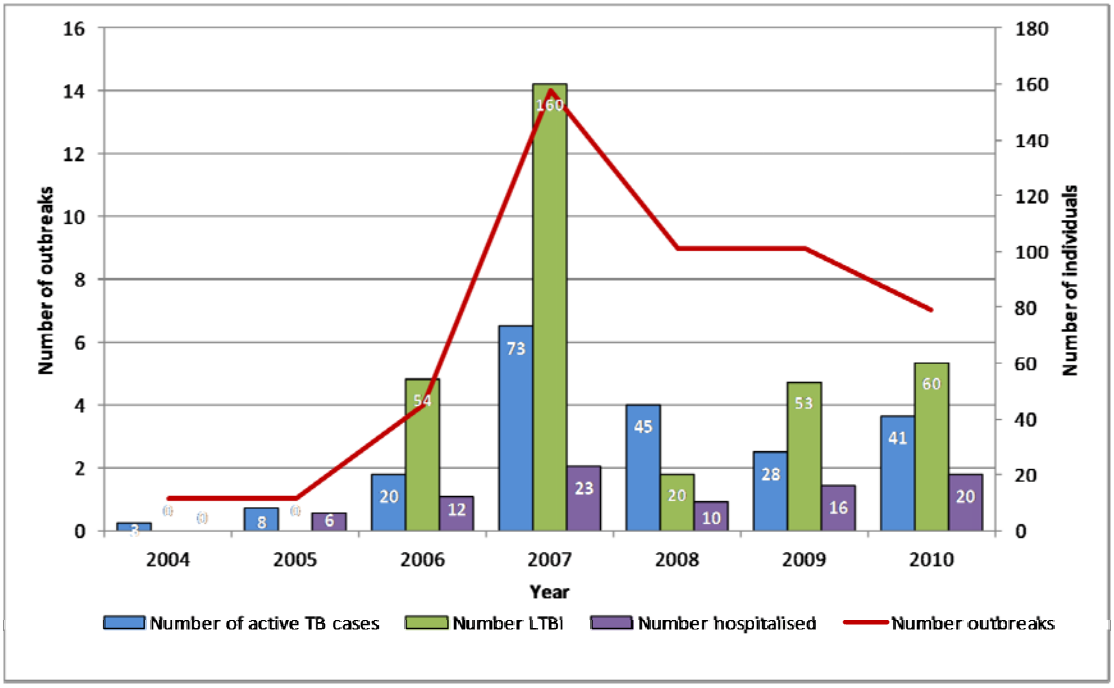

Figure 21: TB outbreak summary by year, 2004-2010

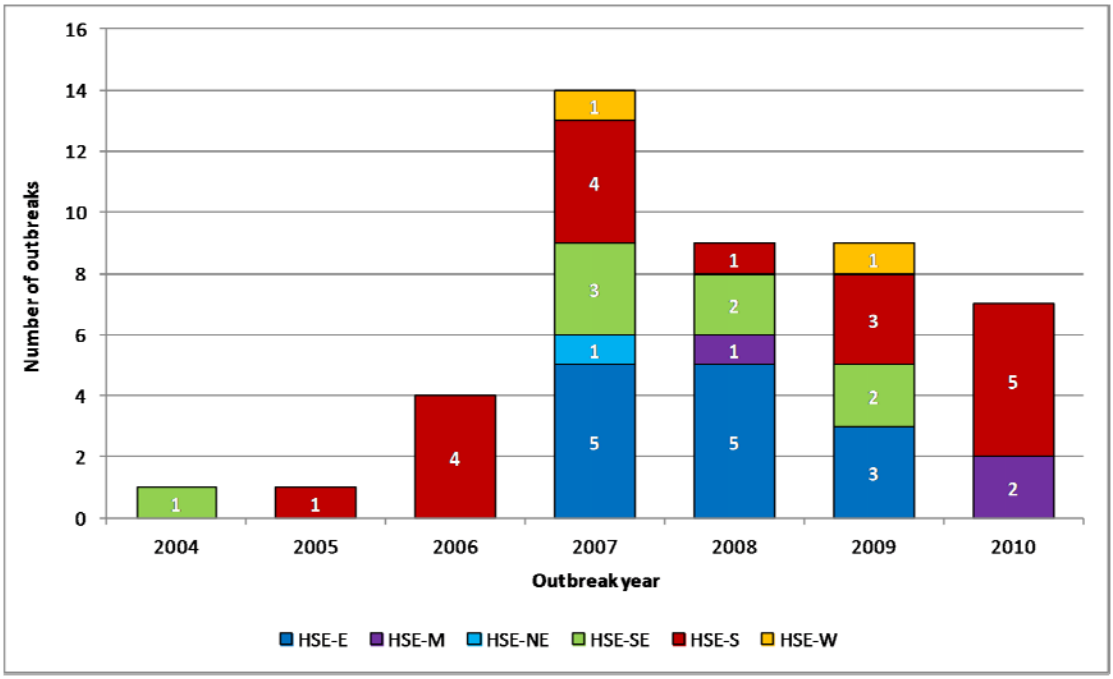

Figure 22: Number of TB outbreaks by HSE area and year, 2004-2010

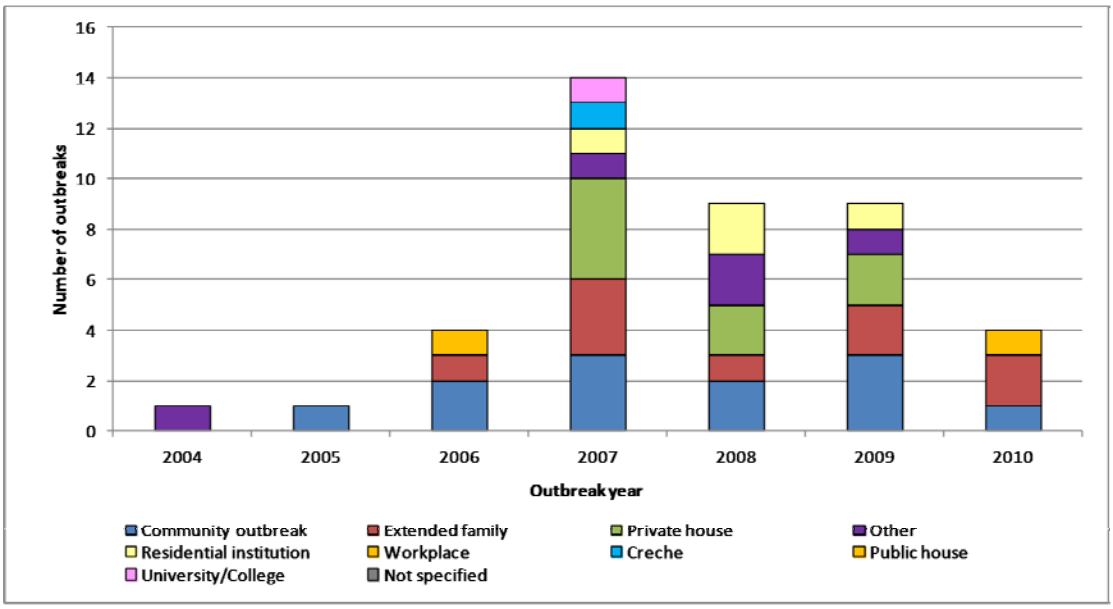

Figure 23: Number of TB outbreaks by location and year, 2004-2010

WHO and ECDC TB elimination target indicators

World Health Organization - Stop TB

The Stop TB partnership was established in 2000 as a global movement to work towards TB elimination. The Stop TB partnership 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.

In 2010 the World Health Organization (WHO) launched the Global Plan to Stop TB 2011-2015 with updated targets for TB control programmes.[8] Table 27 compares the surveillance related Stop TB targets for 2015 with the case based enhanced surveillance data reported on the Irish notifications in 2009.

Table 27: WHO Stop TB target summary

WHO Stop TB target summary	2009 Irish notifications (%)	2015 WHO Target (%)
Percentage of patients with DST results – new cases****	69.2	100.0
Percentage of patients with DST results – previously treated cases††††	63.6	100.0
Treatment success rate – total notifications	64.1	90.0
Percentage of cases with a HIV test result	28.4	100.0

ECDC - Framework Action Plan to Fight TB in the EU

In November 2010, the European Centre for Disease Prevention and Control (ECDC) published a special report entitled *Progressing towards TB elimination a Follow-up to the Framework Action Plan to Fight TB in the EU*.[9] This report contains key operational and epidemiological monitoring targets to help EU member states work towards the goal of TB elimination.

Table 28 compares the surveillance related ECDC framework monitoring core operational indicator targets with the case based enhanced surveillance data reported on the Irish 2009 cohort.

**** *Roadmap to prevent and combat drug resistant tuberculosis,*[10] Annex 2, Indicator 2.1.7. Denominator = all new cases, including culture negative, not done and unknown.

†††† *Roadmap to prevent and combat drug resistant tuberculosis,*[10] Annex 2, Indicator 2.1.8. Denominator = all previously treated cases, including culture negative, not done and unknown.

Table 28: ECDC Monitoring Framework Action Plan Target Operational Indicator summary

ECDC Monitoring Framework Action Plan target summary	2009 Irish notifications (%)	ECDC Target (%)
Percentage of new pulmonary cases culture confirmed	80.1	80.0
Percentage of new pulmonary culture confirmed cases with DST results	94.7	100.0
Treatment success rate – new pulmonary culture confirmed cases	67.7	85.0
Percentage of cases with a HIV test result	28.4	100.0

The ECDC document *Progressing towards TB elimination - a Follow-up to the Framework Action Plan to Fight TB in the EU* also contains four epidemiological monitoring indicators which are outlined below and compared to the current Irish TB data. These indicators assist in monitoring the levels of TB transmission taking place in a country and help to assess progress towards TB elimination.

1. Percentage annual change in TB crude notification rate

ECDC Target: A mean declining trend in the case notification rate over the previous five years allowing for annual random variation in a context where case finding remained constant or increased.

Current Irish status: Between 2006 and 2010, the mean annual percentage change in the TB crude notification rate in Ireland was -0.9%. However, further analysis showed that this was not statistically significant, indicating that the trend in the TB crude notification rate remains stable (figure 24).

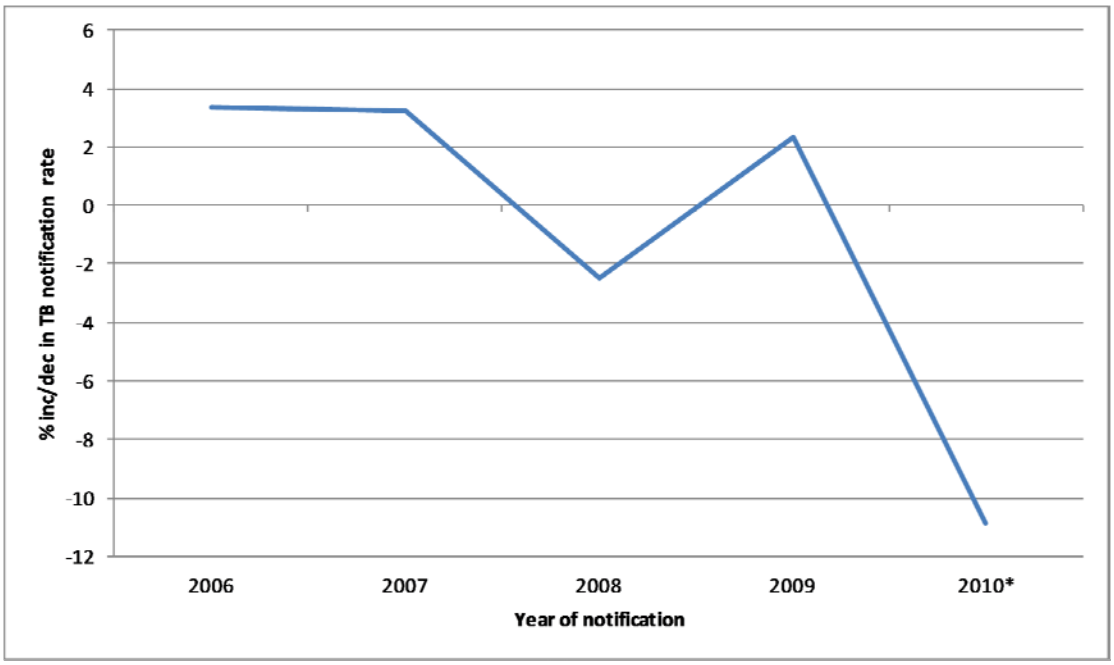

Figure 24: Percentage increase/decrease in TB crude notification rate per 100,000 population, 2006-2010[‡‡‡‡]

[‡‡‡‡] 2010 data are provisional data only

2. Mean age of TB cases

ECDC Target: An increasing trend in the mean age of TB cases over the previous 10 years

Current Irish status: Between 2001 and 2010, the Irish mean annual percentage change in the mean age of total TB notifications was -1.0 (figure 25). Further analysis showed that the decrease in mean age was statistically significant, indicating an overall decrease in the mean age during this time period.

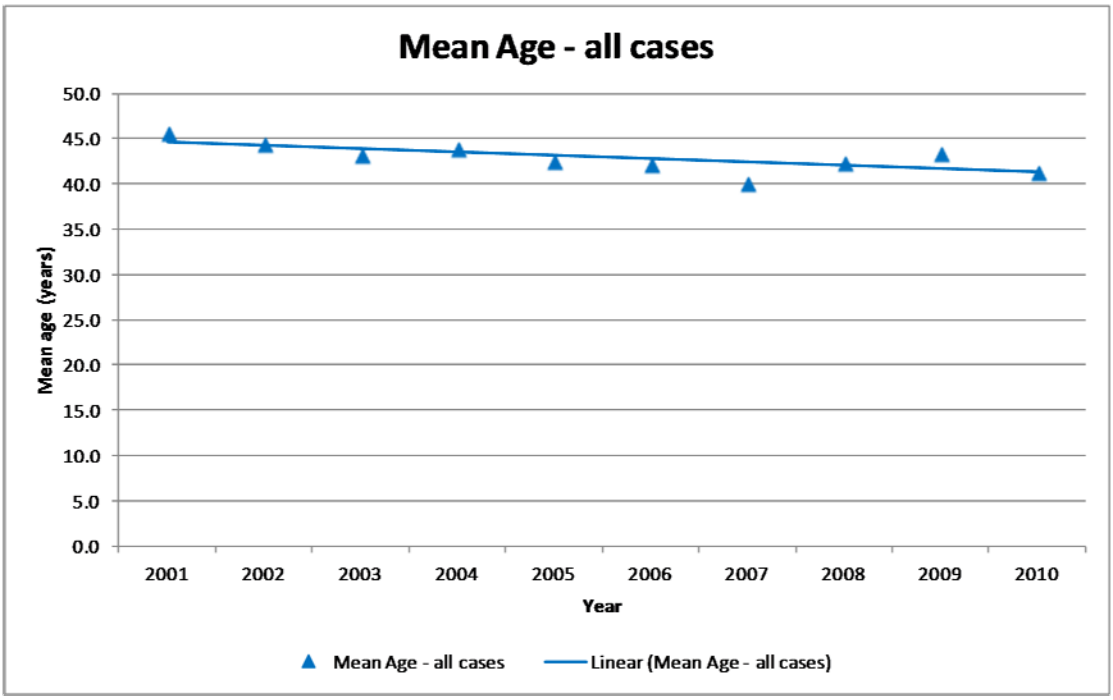

Figure 25: Mean age of TB notifications by year

3. Trend in paediatric to adult TB notification rate ratio

ECDC Target: A mean declining trend in the ratio of the notification rate in children to adults over the previous ten years allowing for random variation.

Current Irish status: The mean annual percentage change in the paediatric to adult rate ratio for Irish TB cases between 2001 and 2010 was 23.9%. However, further analysis showed that this was not statistically significant (figure 26).

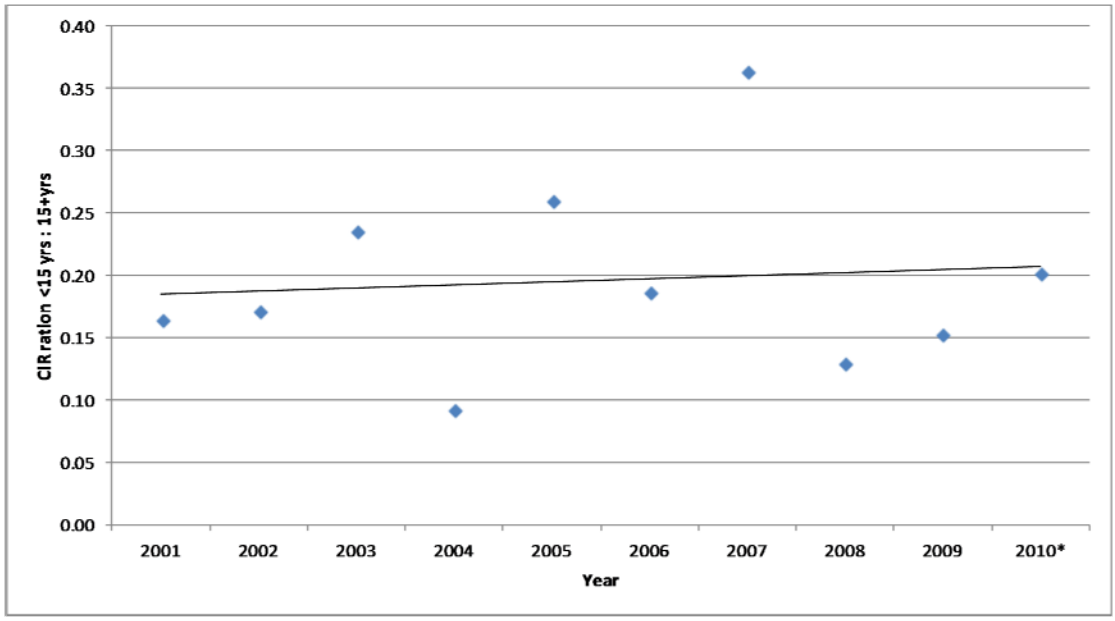

Figure 26: Ratio of paediatric to adult TB notification rates by year, 2001-2010

4. MDR-TB notification rate

ECDC Target: A mean declining trend in MDR TB case notification rate over the previous five years allowing for annual random variation in the context where MDR case-finding efforts remained constant or increased.

Current Irish status: Between 2005 and 2009, the mean annual percentage change in the Irish MDR-TB notification rate was 17.4% (figure 27). However, further analysis showed that this was not statistically significant. Provisional data for 2010 and 2011 indicate that numbers of MDR-TB cases have stabilised since 2008 to a low level with an average of two cases per annum. Due to the very small numbers involved, these data should be interpreted with caution.

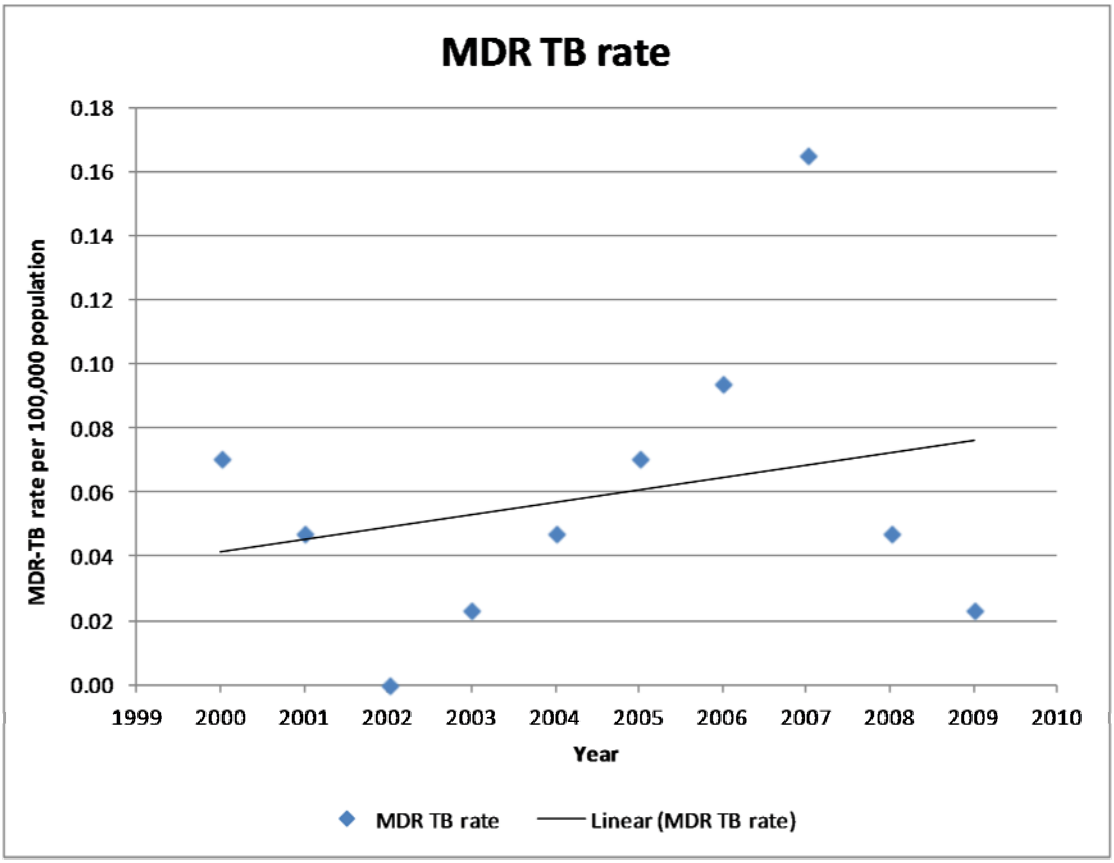

Figure 27: MDR-TB notification rates by year

Conclusion:

Application of the above epidemiological monitoring indicators to the Irish TB data demonstrates that Ireland has not as yet achieved the ECDC targets. This highlights the need to adopt a focused approach to reduce TB transmission in order to reach the TB elimination goal of less than one case per million population by 2050. However, due to the fluctuating trends and/or small numbers involved, these data should be interpreted with caution.

Discussion

This 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 2009, 479 cases of TB were notified to HPSC, a national crude incidence rate of 11.3 per 100,000 population. This is similar to the rates reported between 2006 and 2008 but slightly higher than those reported between 2000 and 2005, which ranged from 9.7 to 10.6 per 100,000 population. The overall notification rate in countries of the EU and Western Europe who report to ECDC was 15.8 per 100,000 population in 2009, ranging from 2.8 per 100,000 population in Iceland to 108.2 per 100,000 population in Romania.[2]

Differences in age-standardised TB incidence rates persist between HSE areas. In 2009, HSE East and HSE South reported the highest rates. HSE West had the lowest rate in 2009. Certain local health offices (LHOs) were found to have particularly high rates of TB incidence including Dublin North West, Dublin North Central and Dublin South City in HSE East. According to the 2006 Census, between 19 and 30% of the population in these LHOs belong to social class 6 and 7 (see Appendix 3 for descriptions of social class).[7]

The highest age-specific rates (per 100,000) in 2009 occurred among those aged 65 years and older (18.4) followed by those aged 25-34 years (17.6).

Rates among males were higher than females for all age groups except for those aged 0-14 years. In 2009, the highest rate in females was in those aged 24-34 years (13.2) and the highest rate among males was in those aged 65 years and over (27.0). The male to female ratio (1.7:1) reported in 2009 was consistent with the rate reported in 2008 (1.5:1) and 2007 (1.6:1). Males are predominant among TB cases in nearly all European countries with an overall M:F ratio in 2009 of 1.8:1.[2]

During 2009, 43.0% of TB cases notified were born outside Ireland. This proportion has steadily increased since 2003 (21.9%) and compares to 43.3% in 2008. In 2009, among countries in the EU and Western Europe who reported data to ECDC, 23.6% of notifications were in foreign-born patients. In Belgium, Slovakia and Slovenia, where crude incidence rates are similar to those reported in Ireland, the percentage of cases of foreign origin in 2009 ranged from 1.4%-48.6%.[2]

The crude rate of TB notifications in the indigenous population was 7.6 per 100,000 population which is similar to the rates in 2008 (7.4) and in 2007 (8.0). The crude rate in foreign-born cases was 33.6 which is similar to rates in 2008 (33.0) and in 2007 (33.0).

There was a notable difference in age between Irish born and foreign-born cases of TB. For Irish born cases, there was a peak among those aged 65 years and older with a median age of 53 years. In foreign-born cases, the peak occurred in those aged 25-

34 years with a median age of 32 years. The majority of foreign-born cases were from Asia (40.8%) and Africa (30.1%). Asia and Africa accounted for 34.2% and 28.6% respectively, of cases of foreign origin reported to ECDC during 2009.[2]

There were eight cases of TB meningitis in 2009, a rate of 1.9 per million population. Of the eight cases of TB meningitis, two were in the 0-4 year age group. Between 1998 and 2009, seven 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*[3] 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 2005 and 2009, there were three cases of TB meningitis reported in children aged less than five years, giving an average notification rate of 1.4 per 10 million population. The criteria for discontinuation of BCG vaccination and how they apply to Ireland are outlined in Appendix 4.[11]

Pulmonary TB was reported in almost two thirds of cases (65.6%) and 34.4% had exclusively extrapulmonary TB. Of the pulmonary cases, almost half (44.7%) were sputum smear positive and the sputum smear-positive rate for 2009 was 3.3 per 100,000 population.

Culture confirmation of specimens and identification of *Mycobacterium tuberculosis* complex (MTC) is the most accurate method of confirming active tuberculosis. Trends in the proportion of culture confirmed pulmonary TB cases are an indicator of the performance of a TB control programme. Of the 314 cases with a pulmonary component 77.4% were culture confirmed an increase from 72.7% in 2008. The proportion of new pulmonary cases that were culture confirmed, increased to 80.1% from 75.0% in 2008. This now reaches the EU monitoring framework target of ≥ 80% culture confirmation among new pulmonary TB cases.[9] Among countries in the EU and Western Europe who reported data to ECDC, the culture confirmed proportion ranged from 44.0% (Bulgaria) to 100.0% (Luxembourg).[2]

Over 9% (44 cases) of all Irish cases reported to HPSC were either culture unknown (13 cases) or culture not done (31 cases). It is important that we endeavour to improve the quality of data relating to the culture status of TB cases in the coming years as this assists in measuring the performance of the TB control programme.

The proportion of new culture confirmed pulmonary cases with reported drug sensitivity testing (DST) results declined from 97.0% in 2008 to 94.7% in 2009. This falls slightly below the EU monitoring framework action plan target of 100% of new culture confirmed pulmonary cases with DST results.[9] ECDC has adopted the culture and DST monitoring targets as a measurement to assess both diagnostic laboratories' and physicians' capabilities to correctly diagnose TB. They recommend that Member States also use these to monitor progress towards TB elimination. The WHO Stop TB strategy also includes a target of 100% DST results for culture positive

cases that were previously treated for TB. During 2009, 91.3% of Irish culture positive cases that were reported as previously treated for TB had DST results available indicating the need to improve accurate reporting of these data.

Of the 26 resistant cases reported during 2009, only one case had MDR-TB which is a decrease compared to recent years with two reported in 2008 and seven reported in 2007. MDR-TB cases and cases resistant to isoniazid represented 0.2% and 3.8% of total cases respectively. This compares to 0.4% and 3.9% respectively in 2008. In 2009 the proportion of new cases with MDR-TB ranged from 0-22% in the EU and Western Europe.[2] MDR-TB or XDR-TB is more likely to be reported 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.[2] In Ireland, the rate of resistance is higher in foreign-born cases than in Irish-born cases. The rate of resistance in foreign-born cases has steadily increased between 2006 and 2009, while the rate of resistance in Irish-born cases has declined during the same period. The majority of resistant cases reported in Ireland had no previous history of TB disease reported.

Drug resistance is an issue that needs to be kept under close review especially with the emergence of XDR-TB and recent reports of four patients in India with "totally drug-resistant TB" ("TDR-TB") with subsequent media reports of a further eight cases.[12,13] 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.[6] In light of recent developments outlined above, focus on drug resistance needs to be sustained in all countries.

In recent years, the quality of the data, and in particular, data on treatment outcome, has improved greatly. However in 2009, information on treatment outcome was provided for 82.5% of cases notified, which is a decrease on the proportion reported in 2008 (88.7%) and 2007 (86.1%).

As part of the WHO Stop TB strategy and the ECDC Framework Action Plan to Fight TB in the EU, three TB treatment outcome monitoring targets are currently in place. WHO have set a target of 90% treatment success rate in all TB cases and a treatment success rate of 75% for MDR-TB cases while ECDC have set a target of 85% treatment success for new pulmonary culture confirmed cases.[8,9]

The proportion of total cases where outcome was reported as completed (64.1%) declined during 2009 compared to 2008 (72.4%) and 2007 (69.2%). This falls short of the WHO Stop TB target of above 90% reported treatment success for all TB cases.[8]

The proportion of new culture confirmed pulmonary TB cases where outcome was reported as completed was 67.7%, which failed to achieve the ECDC EU target of successfully treating 85% or more of all new culture confirmed pulmonary TB cases.[9]

The scope of this indicator is to measure the ability of a TB control programme's ability to retain patients through a complete course of chemotherapy with a favourable clinical result.

The treatment success rate for the MDR-TB cases treated in the 2008 cohort was 0% as both cases died during treatment. However, during 2003 to 2007 treatment success rates ranged between 75%-100%, meeting the WHO Stop TB target of 75% treatment success for MDR-TB cases.[8]

It is important that every endeavour is made to improve the completeness and timeliness of submission of reports of treatment success rate which are essential for efficient TB programme management.

Reported information on TB risk factors has steadily increased from 67.0% in 2005 to 81.4% of all cases during 2009. The proportion of cases with one or more reported TB risk factor(s) has also increased during this time period, from 39.3% in 2005 to 60.8% in 2009. The four most commonly reported risk factors were being from a country of high TB endemicity, followed by substance misuse, contact with a TB case and co-morbidity with an immunosuppressive illness. These data are important as provide information to guide policy to target interventions in relation to TB disease and latent TB infection at the relevant groups.

The proportion of TB cases where HIV status was reported remains notably low at 28.4% of cases during 2009. However, this percentage has steadily increased since 2003 when HIV status was reported for only 2.5% of total cases. Both the WHO Stop TB strategy and the ECDC Framework Action Plan to Fight TB in the EU have set targets of 100% of all TB cases having a HIV status reported.[8,9] The objective of this indicator is to reduce the burden of TB/HIV co-infection by strengthening the collaboration between TB and HIV/AIDS programmes within a health service. The scope of this indicator is to measure the extent to which HIV-positive TB patients are identified and to demonstrate the extent to which HIV testing has been incorporated into the national TB control programme. We must strive to improve the completeness of TB-HIV data in the coming years and in particular as HIV has become notifiable in 2012.

This is the first year that reports on TB outbreaks have been included in this report. As of January 1st 2011, the National TB Surveillance System moved to the Computerised Infectious Disease Reporting system (CIDR). This increased awareness of TB outbreak reporting and also facilitated the retrospective reporting of outbreaks not previously reported. Data on historic TB outbreaks are now more complete and timeliness has been improved for current outbreak reporting. Outbreak reporting assists in the assessment of the burden of TB disease and also will assist in guiding the appropriate use of resources for the TB control programme.

Application of the ECDC epidemiological monitoring indicators to the Irish TB data demonstrates that Ireland has not as yet achieved the ECDC targets. This highlights the need to adopt a focused approach to reduce TB transmission in order to reach

the TB elimination goal of less than one case per million population by 2050. However, regarding the MDR-TB indicator, provisional data for 2010 and 2011 indicate that numbers of MDR-TB cases have stabilised since 2008 to a low level with an average of two cases per annum. Due to the very small numbers involved, these data should be interpreted with caution.

Guidelines on the Prevention and Control of Tuberculosis in Ireland were published in April 2010.[3] 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), outbreak management and contact tracing procedures and screening for TB in special situations e.g. healthcare settings, new entrants to Ireland, prison and homeless settings. 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. Stop TB partnership 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 as they will help guide where resources should be directed e.g. risk groups in order to implement effective TB prevention and control strategies in Ireland and in order to reach the elimination target by 2050.

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Appendix 1: TB Cases Notified in Ireland in 2010, Provisional Data (as of 30th September 2011)

There were 427 cases of TB provisionally notified in 2010. 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, 2010

Parameter	2010
Total number of cases	427
Crude notification rate per 100,000	10.1
Cases in indigenous population[§§§§]	243 (56.9%)
Cases in foreign-born persons	171 (40.0%)
Culture positive cases	270 (63.2%)
Pulmonary cases[*****]	274 (64.2%)
Of which sputum smear positive	113 (41.2%)
Resistant cases	18 (4.2%)
Multidrug-resistant cases	2 (0.5%)
TB meningitis cases	8 (1.9%)

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, 2010

HSE Area	Number of cases	Crude rate per 100,000	95% CI for rate
HSE E	185	12.3	10.6 - 14.1
HSE M	25	9.9	6 - 13.8
HSE MW	29	8.0	5.1 - 11
HSE NE	30	7.6	4.9 - 10.3
HSE NW	19	8.0	4.4 - 11.6
HSE SE	28	6.1	3.8 - 8.3
HSE S	90	14.5	11.5 - 17.5
HSE W	21	5.1	2.9 - 7.2
Ireland	**427**	10.1	**9.1 - 11**

[§§§§] Country of birth unknown for 13 cases

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

Age and Gender
There were 162 cases (37.9%) of TB notified in females, 263 cases (61.6%) in males and two cases where sex was not reported, giving a male to female ratio of 1.6:1. The mean age of cases notified was 41.4 years (range 0 to 98 years).

Geographic origin
Of the 427 cases provisionally notified in 2010, 243 (56.9%) were born in Ireland and 171 (40.0%) were foreign-born. Information on country of birth was not reported for 13 cases (3.0%).

Site of disease
Of the 427 cases provisionally notified in 2010, pulmonary TB was diagnosed in 250 cases (58.5%), extrapulmonary TB in 150 cases (35.1%) and pulmonary and extrapulmonary TB in 24 cases (5.6%). The site of disease was unknown for three cases (0.7%).

Of the 274 cases with a pulmonary disease component, 193 (70.4%) were culture positive and 113 (41.2%) were smear positive.

TB meningitis
There were eight cases of TB meningitis provisionally notified in 2010 giving an incidence rate of 0.19 per 100,000 population (1.9 per million population). Four were in the 25-34 year age group, two were in the 45-64 year age group and two were aged over 65 years. One of the cases reported not having received the BCG vaccination while BCG vaccination status was unknown for the remaining seven meningitis cases.

Three cases were culture positive (two in the 25-34 year and one in 45-54 year age groups) and four were culture negative (two in the 25-34 year age group and one each in the 45-64 years and 65 years and older age groups). Culture status was unknown for the remaining TB meningitis case.

Culture
Of the 427 cases provisionally notified in 2010, 270 (63.2%) were culture confirmed.

Species
Among the 270 culture positive cases, 254 (94.1%) were *M. tuberculosis*, 10 (3.7%) were *M. bovis* and two (0.7%) were *M. africanum*. The species was not provided for four (1.5%) of the culture positive cases.

Antibiotic resistance
Resistance was reported in 18 of the 270 culture positive cases (6.7%), including two cases (0.5% of total cases, 0.7% of culture positive cases) of MDR-TB. Mono-resistance to isoniazid was reported in seven cases, to rifampicin in 2 cases, to ethambutol in one case and to streptomycin in two cases. Three cases were resistant to isoniazid plus streptomycin while one case was resistant to isoniazid plus pyrazinamide, ethambutol and streptomycin.

Appendix 2: Completeness of data, 2009

Completeness of data reported for 2009 notifications ranged from 100.0% (Age) to 28.4% (HIV status) depending on the variable analysed. Of the 18 key variables analysed, 11 had completeness levels of 90% or greater. Table A3 shows the completeness of reporting for 18 key variables during 2009.

Table A3: Completeness of reported data by variable

Variable	% Complete
Age	100.0
Sex	99.4
Diagnostic type	99.8
Country of birth (all notifications)	99.4
Country of birth (for foreign-born cases)	95.4
Sputum smear result (pulmonary cases)	96.7
Culture result	97.3
Isolate (Culture positive cases)	99.2
Isoniazid sensitivity result (Culture positive cases)	97.7
Rifampicin sensitivity result (Culture positive cases)	97.7
Case finding method	92.1
Treatment outcome	82.5
Risk group	81.4
Previous history of TB (all cases)	86.8
Previous year of TB diagnosis (previously diagnosed cases)	80.8
Previous TB treatment history (previously diagnosed cases)	69.2
Previous TB treatment outcome (previously treated cases)	75.8
HIV status	28.4

Appendix 3: Social Class (Source: CSO 2006)

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 4: BCG vaccination

The Health Protection Surveillance Centre *Guidelines on the prevention and control of tuberculosis in Ireland 2010*,[3] based on the recommendations of the International Union Against Tuberculosis and Lung Disease (IUATLD),[11] 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 2009 report is the twelfth 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 2009, the national rate for sputum smear positive pulmonary TB was 3.3 per 100,000 population while in 2008 and 2007 the rates were 3.7 and 3.6 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 (2005-2009), the average annual notification rate of TB meningitis in children aged less than five years was 1.42 per 10 million general population. Between 2005 and 2009, there were three cases of TB meningitis in children under five years of age (one in 2006 and two in 2009).

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 2009 age-specific incidence rate for children 0-14 years was 2.1 per 100,000, 7 times the rate recorded in Sweden when they discontinued neonatal BCG vaccination. In 2008, 2007, 2006 and 2005, the age-specific incidence rate for children aged 0-14 years was 1.7, 4.7, 2.4 and 3.2 per 100,000 population respectively.

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