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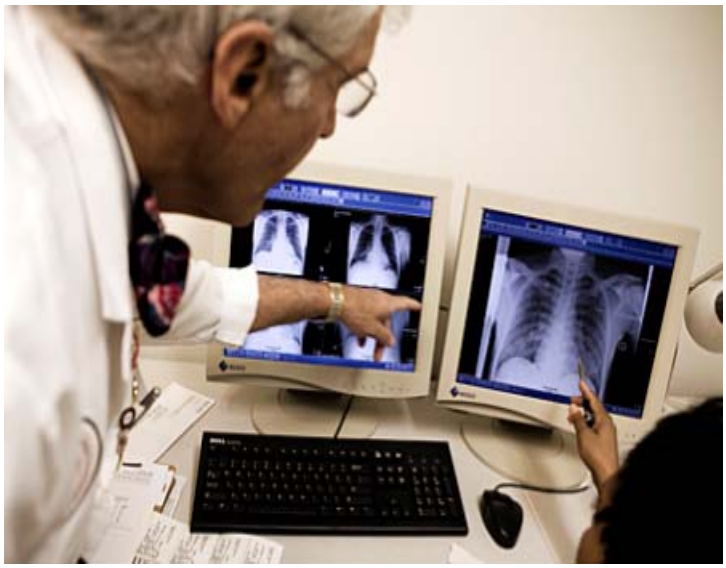

Report on the Epidemiology of Tuberculosis in Ireland 2010

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

hpsc

Epidemiology of Tuberculosis in Ireland 2010

A Report by the
Health Protection Surveillance Centre

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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 of 2010 TB notifications

- TB case notifications decreased in 2010 (n=420, rate 9.2/100,000) compared to 2009 (n=479, rate 10.4/100,000). This is the lowest crude notification rate recorded since TB surveillance began in 1998.

- Regional variation was noted in TB notification rates (per 100,000) ranging from 4.7 in HSE West to 13.5 in HSE South.

- The highest rates were reported by Dublin North Central and Dublin South City in HSE East and by North Cork and South Lee in HSE South.

- The highest age-specific rate occurred among those aged 65 years and older (14.8/100,000).

- The age-specific rate (per 100,000) among 55-64 years olds decreased from 11.7/100,000 in 2009 to 5.6/100,000 in 2010.

- Rates were higher in males for all age groups except for the 15-24 year age group. The highest rates among males were in those aged 65 years and older and among females in those aged 15-24 years.

- In 2010, 40.7% of cases were born outside Ireland compared to 43.0% in 2009 and 43.3% in 2008.

- There was a notable difference in age between cases born in Ireland (median age 49 years) and foreign born cases (median age 30 years).

- In 2010, 270 (64.3%) of the TB cases had a pulmonary disease component of which 206 (76.3%) were culture positive and 111 (41.1%) were smear positive.

- There were nine cases of TB meningitis notified (age range: 28 to 78 years).

- Treatment outcome data were provided for 88.1% of cases. Treatment was reported as completed for 72.4% of total cases and for 71.2% of sputum smear positive cases notified.

- There were 27 deaths reported (8 attributable to TB).

- There were 26 drug-resistant cases notified, including two MDR-TB cases. There were no cases of XDR-TB reported in 2010.

- There were 424 cases of TB provisionally notified in 2011 which remains stable in comparison to 420 cases reported in 2010.

Introduction

In 2011, 6.2 million cases of TB were notified by national TB control programmes and reported to WHO (88.5 per 100,000 population). Of these, 2.6 million were new pulmonary sputum smear positive cases. Approximately 1.4 million TB deaths occurred globally in 2011.[1]

In 2010, 388,875 cases of TB were reported by 52 of the 54 countries of the WHO European Region. The overall notification rate averaged at 43.2 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 plus Iceland and Norway) at 14.6 per 100,000 population, with rates lower than 10 per 100,000 reported in 18 countries and higher than 20 per 100,000 in Romania (98.2), the Baltic States – Lithuania (58.2), Latvia (41.5) and Estonia (24.5), Bulgaria (35.0) and Portugal (24.7).

In 2010, 25.1% of reported TB cases in Western Europe were of foreign origin. This proportion ranged from 0.1% to 88.8% across 29 countries. Multidrug-resistance remained most frequent in the Baltic States (12.2%-24.4%) followed by Romania (9.4%). Other countries reported lower levels of MDR-TB (0.0-6.3%) where it was generally more common in foreign-born cases.

In 2010, 314,879 notifications were reported from the 24 non-EU European and central Asian countries of which 51.6% were from the Russian Federation. The highest rates per 100,000 population in this region were reported by Kazakhstan (178.1) and Moldova (152.5) while the lowest rates were reported by Monaco (2.8) and Israel (4.8). The highest burden of MDR-TB cases in the European region is in this area where the prevalence is 16.6% in newly diagnosed cases, almost seven times higher than the prevalence reported in the EU/EEA countries (2.4%).

Overall, the proportion of cases with multidrug-resistant TB (MDR-TB) across the entire European region was 22.2% a slight increase compared to 2009 (20.5%). The proportion of total cases with MDR-TB was higher in the non-EU countries of Europe (27.8%) compared to the proportion in Western Europe (4.6%). 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 Ireland in 2010. Data for 2010 have been validated and updated to include information relating to treatment outcome. Provisional data for 2011 are presented in Appendix 1.

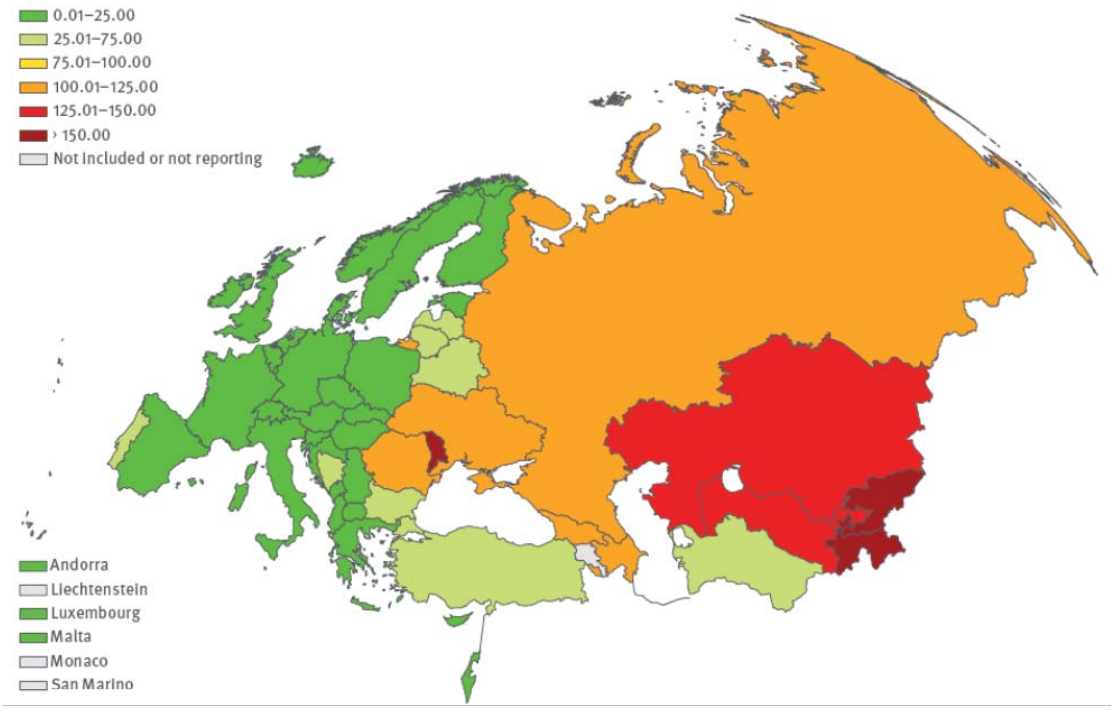

Figure 1: Tuberculosis notification rates per 100,000 population, WHO European region, 2010[2]

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 2010 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 Hhttp://www.hpsc.ie/hpsc/NotifiableDiseases/CaseDefinitions/H

- 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 2010. 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). Data for 2011 were reported via the Computerised Infectious Disease Reporting (CIDR) system. Each HSE area provided finalised 2010 data (with outcome information) and provisional 2011 data to HPSC between April and September 2012. 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 second 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 to 2010 were obtained from the NTBS system. Provisional data for 2011 were taken from the Computerised Infectious Disease Reporting (CIDR) 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; rates for 2004, 2005, 2006, 2007 and 2008 are based on the 2006 population census and rates for 2009, 2010 and 2011 are based on the 2011 census. For the calculation of rates in the indigenous and foreign-born population, denominator 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 2011 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 2010 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. 2010 LHO rates were calculated using Census 2011 LHO denominator data extracted from Health Atlas for all LHOs except HSE-SE, who supplied regionally calculated Census 2011 LHO denominator data.

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 2010. This is the second year that data completeness is described in this report.

Results: TB cases in Ireland, 2010

Overall cases and rates

There were 420 cases of TB notified in 2010, a rate of 9.2 per 100,000 population. A summary of the 2010 data is shown in table 1.

Table 1: Summary of the epidemiology of TB in Ireland, 2010

Parameter	Number (Rate/100,000)	% of Total
Total cases	420 (9.2)	-
Cases in indigenous population[§]	246 (6.5)	58.6
Cases in foreign-born persons[*]	171 (22.3)	40.7
Culture positive cases	281	66.9
Pulmonary cases	270	64.3
Smear positive pulmonary cases	111	26.4
Multidrug-resistant cases	2	0.5
Mono-resistant to isoniazid	10	2.4
Deaths attributable to TB	8	1.9
Outcomes reported in cases	370	88.1
TB meningitis cases	9	2.1

[§] Country of birth was unknown for 3 (0.7%) cases

The number and rates of TB cases notified for each of the years from 1991-2010 are shown in table 2. Three-year moving averages for the years 1992-2009 are also shown.

Table 2: Number and rates of notified cases of TB in Ireland, 1991-2010 with 3-year moving averages, 1992-2009

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	410	10.4	402
2003	406	10.4	413
2004	433	10.2	430
2005	448	10.6	448
2006	463	10.9	464
2007	481	11.3	473
2008	467	11.0	474
2009	479	10.4	461
2010	420	9.2	

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 South at 13.5 per 100,000 population which was significantly higher than the national rate. Rates in HSE West (4.7) and HSE South East (5.4) were significantly lower than the national rate.

The crude incidence rates seen in each HSE area from 1992 to 2010 are shown in table 4 while the 3-year moving average TB notification rates for each HSE area from 1992 to 2009 are shown in table 5.

Table 3: Notified TB cases by HSE area, 2010

HSE area	Number of cases	Crude rate per 100,000	95% CI for rate
HSE E	180	11.1	9.5 - 12.7
HSE M	24	8.5	5.1 - 11.9
HSE MW	29	7.6	4.9 - 10.4
HSE NE	30	6.8	4.4 - 9.2
HSE NW	19	7.4	4 - 10.7
HSE SE	27	5.4	3.4 - 7.5
HSE S	90	13.5	10.7 - 16.3
HSE W	21	4.7	2.7 - 6.7
Ireland	**420**	**9.2**	**8.3 - 10**

Table 4: Crude TB incidence rates per 100,000 population by HSE area, 1992-2010

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	14.5	8.9	7.1	6.1	9.7	7.4	12.3	4.7	**10.4**
2010	11.1	8.5	7.6	6.8	7.4	5.4	13.5	4.7	**9.2**

Table 5: 3-year moving average TB notification rate 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	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	15.2	8.6	7.3	5.3	7.2	6.7	14.2	7.6	**11.0**
2009	14.0	8.9	7.2	5.9	8.2	6.7	13.1	5.4	**10.3**

Age and sex distribution

There were 159 (37.9%) cases of TB notified in females in 2010 and 261 (62.1%) in males, giving a male to female ratio of 1.6:1. Table 6 gives the breakdown of notified TB cases by sex and HSE area.

Table 6: TB cases by HSE area and sex, 2010

HSE area	Female	Male	Male:Female ratio	Total
HSE E	66	114	1.7	**180**
HSE M	13	11	0.8	**24**
HSE MW	12	17	1.4	**29**
HSE NE	7	23	3.3	**30**
HSE NW	11	8	0.7	**19**
HSE SE	13	14	1.1	**27**
HSE S	29	61	2.1	**90**
HSE W	8	13	1.6	**21**
Total	**159**	**261**	**1.6**	**420**

In 2010, the median age of cases was 37 years (range: 0-98 years). The median age for Irish-born cases was 49 years and 30 years for foreign-born cases. One hundred and five cases (25.0%) were aged between 25 and 34 years.

Table 7 shows the number of cases and the age-specific rates for males and females in 2010. The highest age-specific rate in 2010 occurred among those aged 65 years and older (14.8/100,000). The age-specific rate (per 100,000) among 55-64 year olds decreased from 11.7/100,000 in 2009 to 5.6 in 2010.

Rates in males were higher in all age groups except in the 15-24 year age group (F 13.1 vs. M 11.0). The highest rate among females was in the 15-24 year age group (13.1) and the highest rate among males was in the over 65 year age group (21.0). Figure 2 shows the cases by age and sex and the male and female age-specific rates in Ireland for 2010. Figure 3 shows the age-specific rates of TB in Ireland from 2000 to 2010.

Table 7: TB cases and age-specific rates per 100,000 population for males and females, 2010

Age Group (years)	Female		Male		Total	
	Cases	Rate	Cases	Rate	Cases	Rate
0-14	5	1.0	16	3.2	**21**	**2.1**
15-24	38	13.1	32	11.0	**70**	**12.1**
25-34	39	10.1	66	17.9	**105**	**13.9**
35-44	23	6.6	46	13.2	**69**	**9.9**
45-54	18	6.2	32	11.1	**50**	**8.6**
55-64	8	3.5	18	7.8	**26**	**5.6**
65+	28	9.6	51	21.0	**79**	**14.8**
Total	**159**	**6.9**	**261**	**11.5**	**420**	**9.2**

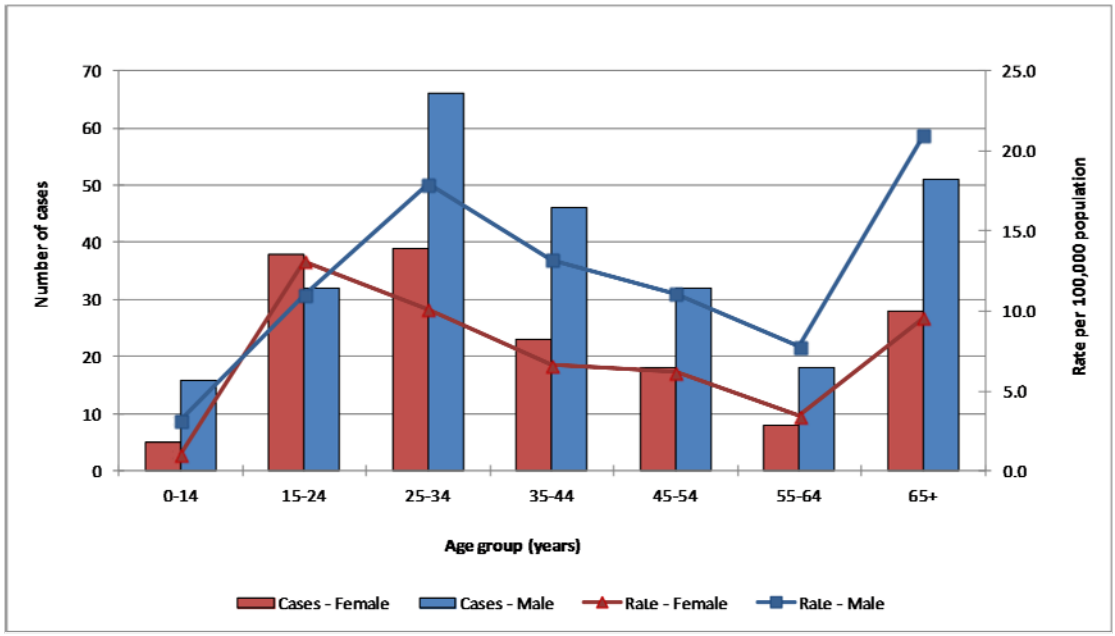

Figure 2: TB cases by age and sex, and age-specific rates per 100,000 population, 2010

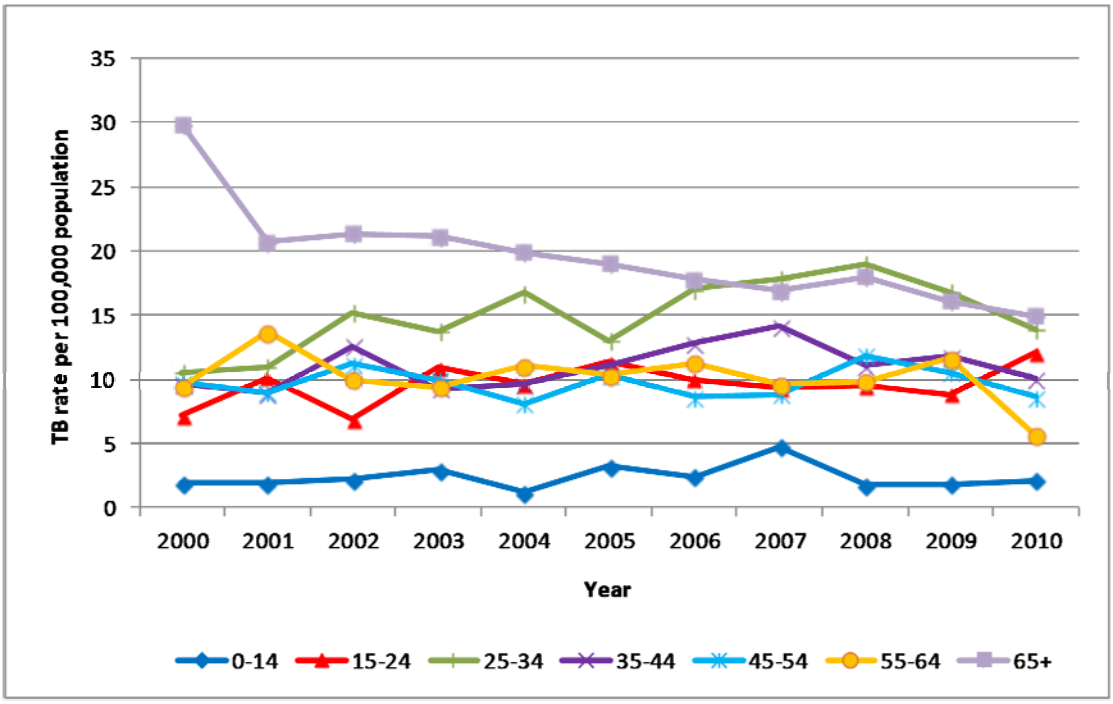

Figure 3: Age-specific rates of TB by year, 2000-2010

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 South (13.6) and HSE East (10.8). The rate in HSE South was significantly higher than the national rate (9.2). The lowest rates were reported by HSE West (4.7) and HSE South East (5.4), both of which were significantly lower than the national rate.

Age-standardised incidence rates for each county for 2010 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 Westmeath (21.8) and Cork (16.4). The lowest rates (per 100,000) were in Wexford (2.2), Longford (2.3), Leitrim (2.3), Laois (2.5) and Mayo (2.9).

Crude incidence rates for each local health office (LHO)** in 2010 are shown in table 9. Three-year moving averages for the crude incidence rates are presented in table 10. In 2010, the highest crude rates (per 100,000 population) were in Dublin North Central LHO (22.9), North Cork (19.0), South Lee (18.8) and Dublin South City LHO (17.3).

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

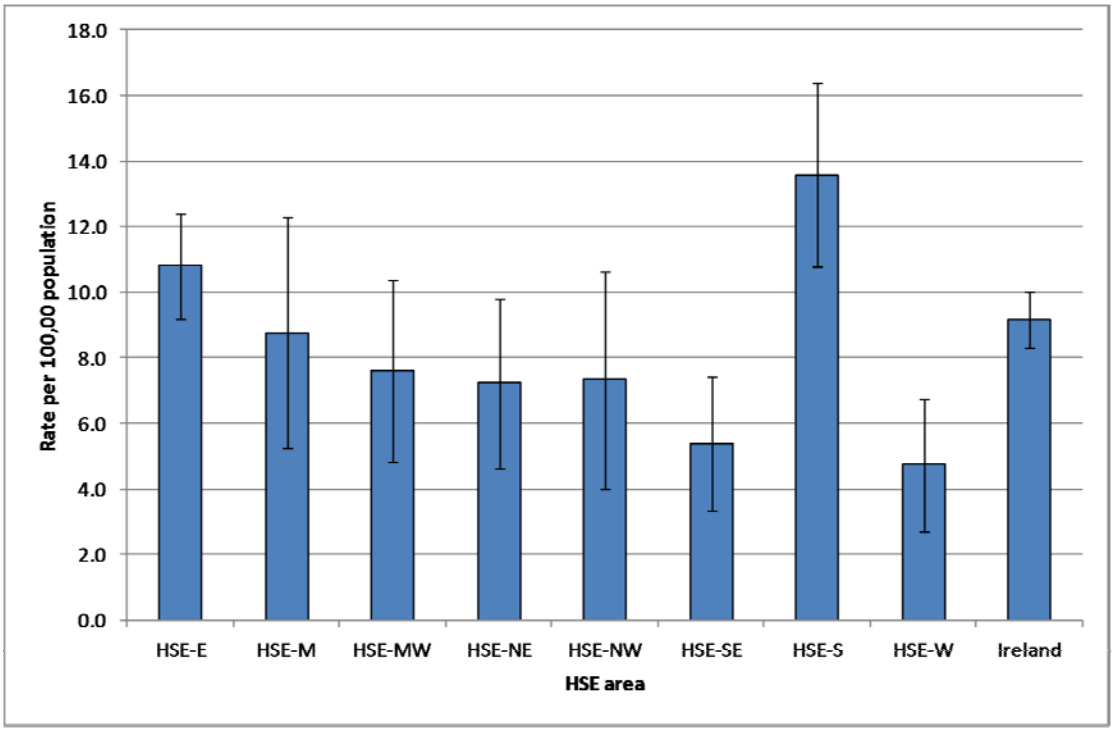

Figure 4: Age-standardised TB incidence rates per 100,000 population by HSE area with 95% confidence intervals, 2010

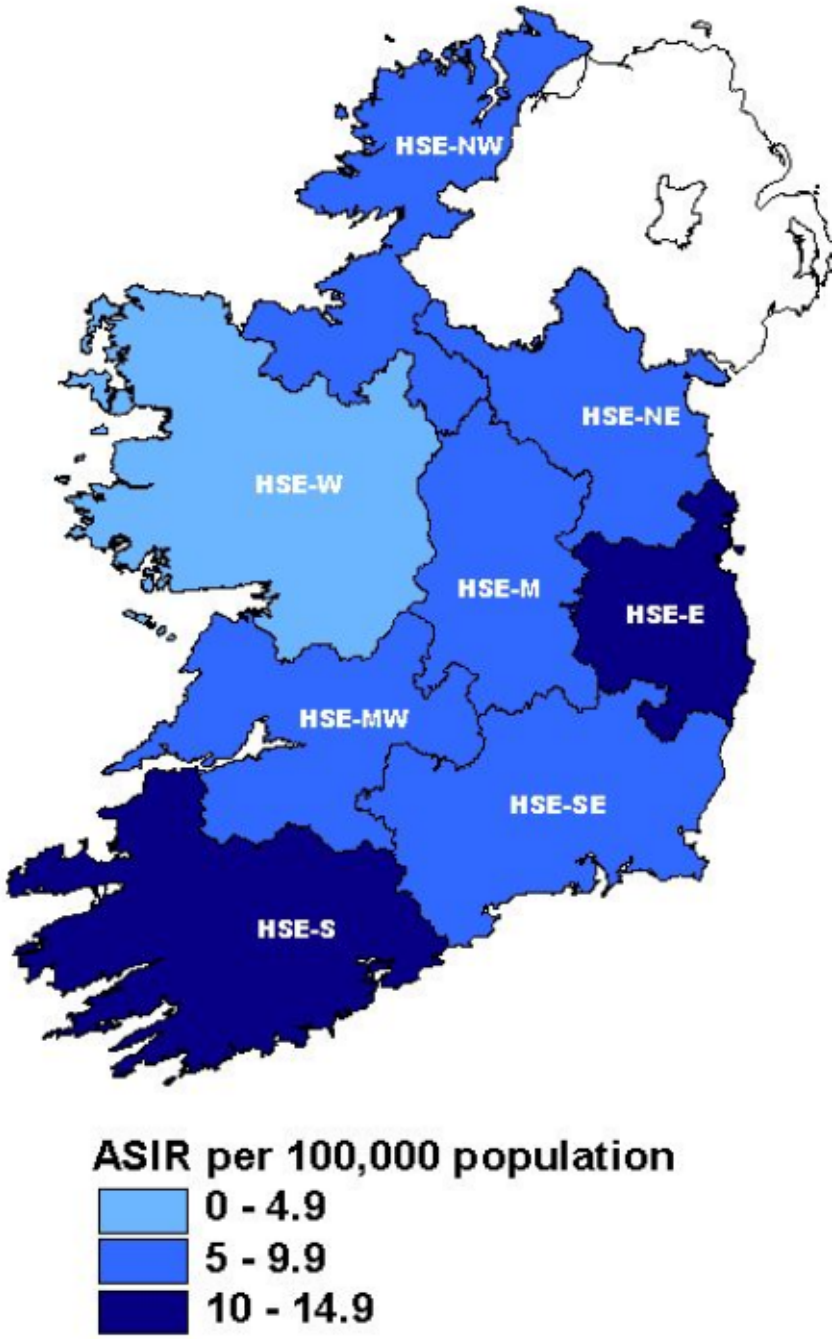

Figure 5: Age-standardised TB incidence rates per 100,000 population by HSE area, 2010

Table 8: Age-standardised TB incidence rates (per 100,000 population) by county with 95% confidence intervals, 2010

County	ASIR	95% CI
Dublin	12.7	10.8 - 14.7
Kildare	5.7	2.3 - 9.1
Wicklow	3.1	0 - 6.1
Laois	2.5	-1 - 5.9
Longford	2.3	-2.2 - 6.7
Offaly	3.7	-0.5 - 7.9
Westmeath	21.8	11.7 - 31.9
Clare	8.9	3.3 - 14.6
Limerick	7.9	3.9 - 11.8
Tipperary North	4.8	0.1 - 9.5
Cavan	10.0	2.5 - 17.5
Louth	7.8	2.7 - 13
Meath	6.8	2.9 - 10.7
Monaghan	3.2	-1.2 - 7.6
Donegal	5.8	2 - 9.7
Leitrim	2.3	-2.3 - 6.9
Sligo	13.8	4.7 - 23
Carlow	7.5	0.1 - 14.8
Kilkenny	3.2	-0.5 - 6.9
Tipperary South	7.2	1.8 - 12.6
Waterford	8.7	3.3 - 14.2
Wexford	2.2	-0.3 - 4.8
Cork	16.4	12.8 - 19.9
Kerry	4.6	1.1 - 8
Galway	5.9	2.9 - 9
Mayo	2.9	0 - 5.9
Roscommon	3.3	-1.4 - 8
Ireland	**9.2**	**8.2 - 10.1**

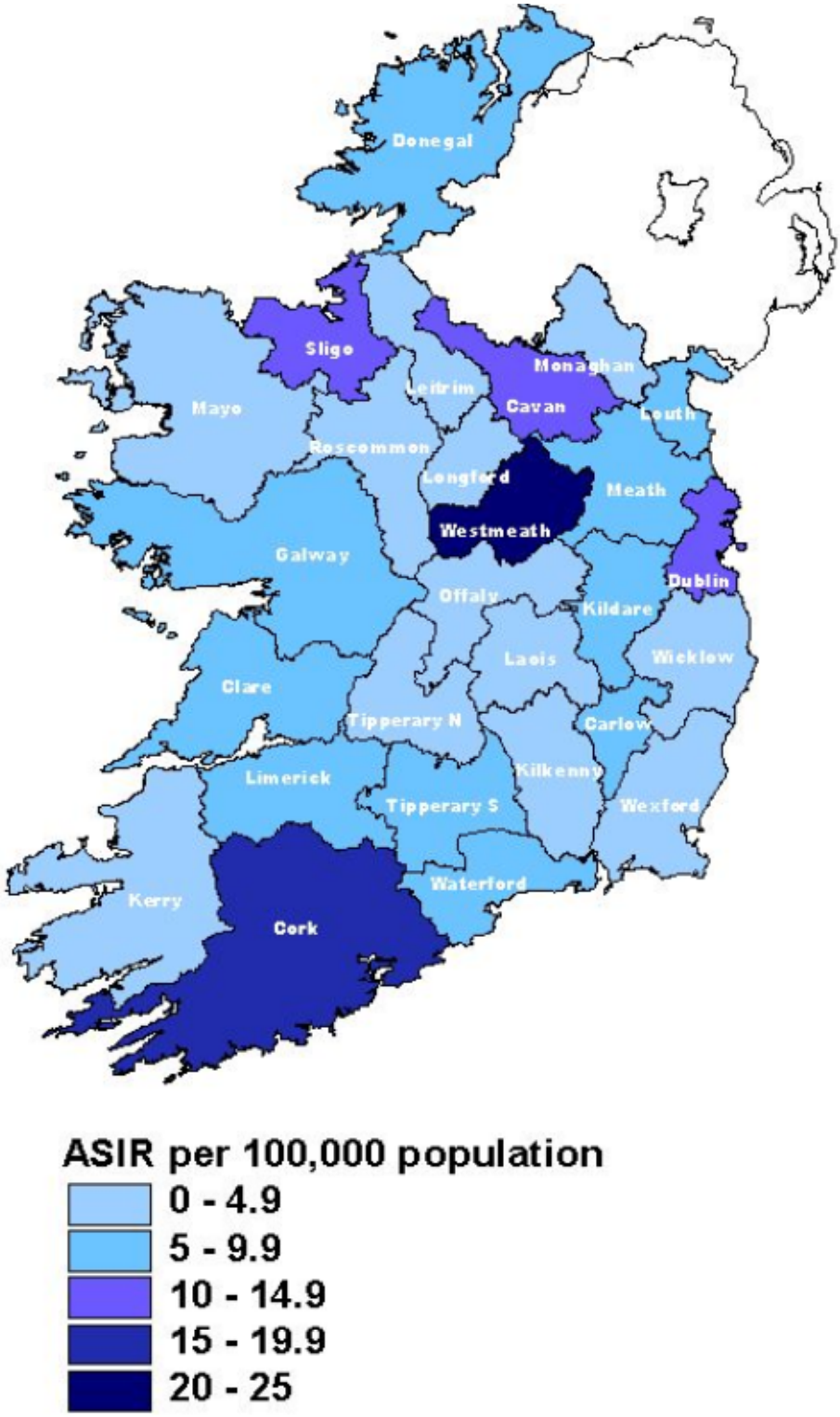

Figure 6: Age-standardised TB incidence rates per 100,000 population by county, 2010

Table 9: TB Crude incidence rate per 100,000 population by local health office (LHO[††]), 2000-2010

HSE area	LHO	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
HSE-E	**Total**	**10.2**	**12.3**	**11.6**	**11.9**	**12.7**	**12.9**	**12.7**	**14.6**	**15.9**	**14.5**	**11.1**
	Dublin South	5.4	2.3	4.7	4.7	9.5	4.0	5.5	8.7	4.7	6.9	4.6
	Dublin South East	13.3	5.7	8.6	7.6	10.0	7.2	5.4	10.0	15.4	8.7	6.9
	Dublin South City	7.7	26.1	21.5	23.0	23.1	20.1	19.4	29.8	29.8	20.0	17.3
	Dublin South West	6.9	8.2	7.5	10.3	8.1	12.2	5.4	14.9	6.8	17.5	12.3
	Dublin West	11.9	10.3	18.3	19.1	20.1	18.7	17.9	16.4	28.4	17.8	14.4
	Dublin North West	16.8	18.7	23.0	17.4	12.9	19.4	21.0	24.7	21.5	25.3	16.4
	Dublin North Central	18.8	27.8	18.8	21.2	26.9	23.7	26.1	23.7	24.5	22.2	22.9
	Dublin North	10.8	11.8	5.4	4.9	11.7	9.9	11.7	8.6	9.5	11.5	9.0
	Kildare/West Wicklow	5.0	5.0	7.8	8.4	5.4	7.9	6.9	7.4	14.3	6.1	4.8
	Wicklow	5.0	8.0	1.0	5.0	2.7	5.5	7.3	2.7	5.5	9.3	3.4
HSE-M	**Total**	**7.1**	**3.1**	**8.4**	**5.3**	**3.6**	**6.4**	**6.0**	**6.4**	**9.5**	**8.9**	**8.5**
	Longford/Westmeath	8.7	6.8	7.8	7.8	4.4	8.8	5.3	6.2	14.1	8.8	15.2
	Laois/Offaly	5.7	0.0	9.0	3.3	2.9	4.4	6.5	6.5	5.8	8.9	3.2
HSE-MW	**Total**	**13.8**	**7.1**	**9.7**	**12.1**	**12.2**	**14.7**	**10.2**	**8.3**	**6.9**	**7.1**	**7.6**
	Clare	11.6	5.8	9.7	6.8	10.8	19.8	8.1	7.2	3.6	6.8	8.5
	Limerick[‡‡]	na	na	na	na	11.9	13.2	14.5	9.3	11.2	8.3	7.8
	Tipp Nth/East Limerick[‡‡]	na	na	na	na	14.2	11.1	6.1	8.1	4.0	4.3	5.7
HSE-NE	**Total**	**6.1**	**11.0**	**7.0**	**7.5**	**5.8**	**3.3**	**8.4**	**6.1**	**4.6**	**6.1**	**6.8**
	Cavan/Monaghan	2.8	14.8	5.6	9.3	5.1	6.7	8.4	5.1	6.7	6.0	6.7
	Louth/South Monaghan	12.8	9.8	11.8	10.8	8.1	1.8	7.2	8.1	5.4	5.7	7.3
	Meath	3.7	9.0	4.5	3.7	4.9	1.8	9.2	5.5	2.5	6.5	6.5
HSE-NW	**Total**	**4.1**	**5.9**	**5.4**	**4.1**	**6.7**	**6.3**	**3.8**	**7.2**	**5.9**	**9.7**	**7.4**
	Donegal	2.9	3.6	4.4	2.9	6.8	4.1	2.7	6.8	4.8	8.1	5.6
	Sligo/Leitrim	5.9	9.4	7.0	5.9	6.6	9.9	5.5	7.7	7.7	12.3	10.3
HSE-SE[§§]	**Total**	**9.7**	**4.7**	**11.6**	**8.3**	**7.4**	**8.0**	**11.1**	**6.3**	**6.5**	**7.4**	**5.4**
	Carlow/Kilkenny	13.5	8.1	10.8	9.0	7.5	6.6	7.5	5.8	5.0	3.8	5.4
	Tipperary South	10.7	2.4	4.7	9.5	7.9	13.6	20.4	9.0	6.8	9.6	7.4
	Waterford	12.6	7.2	23.3	11.7	13.3	9.2	13.3	8.3	9.2	14.9	7.8
	Wexford	2.6	0.9	6.0	3.4	1.5	4.6	6.1	3.0	5.3	2.8	2.1
HSE-S	**Total**	**13.8**	**12.4**	**13.3**	**16.0**	**12.6**	**12.2**	**15.3**	**16.4**	**14.0**	**12.3**	**13.5**
	Kerry	8.3	6.8	10.6	12.1	10.0	6.4	6.4	6.4	7.2	5.5	4.8
	North Cork	21.8	9.5	15.0	10.9	12.4	6.2	8.7	7.4	8.7	13.4	19.0
	North Lee	16.7	21.8	18.6	22.4	14.9	21.5	28.0	19.7	22.1	13.8	16.5
	South Lee	10.7	10.7	12.5	19.7	11.2	11.7	16.2	30.1	15.6	16.2	18.8
	West Cork	13.8	7.9	3.9	2.0	7.5	9.3	5.6	0.0	9.3	10.6	0.0
HSE-W	**Total**	**10.0**	**8.9**	**8.7**	**6.0**	**10.4**	**10.9**	**7.7**	**10.6**	**7.5**	**4.7**	**4.7**
	Galway	10.5	10.0	5.7	5.3	9.5	11.2	8.2	13.4	7.8	6.4	6.0
	Mayo	8.5	4.3	9.4	8.5	7.3	9.7	7.3	4.8	6.5	2.3	3.1
	Roscommon	11.2	14.9	18.6	3.7	20.4	11.9	6.8	11.9	8.5	3.1	3.1
Ireland		**10.1**	**9.7**	**10.5**	**10.4**	**10.2**	**10.6**	**10.9**	**11.3**	**11.0**	**10.4**	**9.2**

[††] 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

§§ Rates for HSE-SE LHOs were calculated using locally produced denominator data

Table 10: TB 3 year moving average rates (per 100,000 population) by local health office[***], 2001-2009

HSE area	LHO	2001	2002	2003	2004	2005	2006	2007	2008	2009
HSE-E	**Total**	**11.6**	**11.9**	**12.0**	**12.6**	**12.8**	**13.2**	**14.5**	**15.2**	**14.0**
1	Dublin South	3.7	4.1	5.9	6.9	5.7	5.9	6.9	6.3	5.8
2	Dublin South East	8.3	7.6	8.4	8.7	7.5	7.0	10.2	12.3	9.9
3	Dublin South City	20.3	23.0	22.6	22.3	20.7	22.1	27.2	27.3	21.8
4	Dublin South West	7.7	8.4	9.1	9.7	9.5	9.5	10.5	11.5	13.5
5	Dublin West	12.7	16.5	19.2	19.5	18.8	17.7	19.8	22.7	19.6
6	Dublin North West	19.3	20.6	17.7	15.7	18.2	21.5	23.0	23.3	22.1
7	Dublin North Central	23.3	21.6	22.0	24.7	25.1	24.9	24.5	23.7	22.9
8	Dublin North	9.9	6.9	6.7	9.6	10.8	10.5	9.6	9.7	10.3
9	Kildare/West Wicklow	5.7	7.3	7.5	6.8	7.0	7.3	9.0	10.5	7.8
10	Wicklow	5.5	3.8	3.4	4.0	5.3	5.7	4.6	5.8	6.9
HSE-M	**Total**	**5.4**	**6.3**	**5.7**	**4.7**	**5.6**	**6.2**	**7.1**	**8.6**	**8.9**
	Longford/Westmeath	7.5	7.5	6.9	6.3	6.8	6.4	7.9	10.8	11.7
	Laois/Offaly	3.7	5.3	4.6	3.4	4.5	6.0	6.3	6.8	6.7
HSE-MW	**Total**	**9.4**	**9.6**	**11.5**	**12.8**	**12.9**	**10.9**	**8.4**	**7.3**	**7.2**
	Clare	8.2	8.0	8.5	12.1	14.6	10.8	6.5	5.3	6.4
	Limerick[†††]	na	na	na	12.8	13.2	12.9	11.1	10.0	8.9
	Tipp Nth/East Limerick[***]	na	na	na	13.5	10.6	7.8	6.6	5.1	4.6
HSE-NE	**Total**	**8.8**	**8.1**	**7.0**	**5.6**	**5.2**	**6.5**	**6.3**	**5.3**	**5.9**
	Cavan/Monaghan	9.5	8.8	7.3	6.5	6.7	7.2	6.3	6.1	6.4
	Louth/South Monaghan	11.0	11.0	10.4	7.2	4.7	6.1	7.2	6.1	6.0
	Meath	6.5	5.4	4.2	3.8	4.5	6.4	5.7	4.2	5.5
HSE-NW	**Total**	**5.3**	**5.2**	**5.1**	**6.0**	**5.8**	**5.3**	**6.0**	**7.2**	**8.2**
	Donegal	3.6	3.8	4.2	5.1	4.4	4.1	5.3	6.1	6.6
	Sligo/Leitrim	7.9	7.3	6.3	7.2	8.0	7.1	7.1	8.9	10.7
HSE-SE	**Total**	**7.7**	**9.0**	**8.9**	**7.8**	**8.6**	**9.1**	**7.5**	**6.7**	**6.7**
	Carlow/Kilkenny	10.1	9.7	9.1	7.6	7.0	6.8	6.0	4.9	4.5
	Tipperary South	5.0	5.3	7.9	9.7	13.9	15.8	11.3	8.0	8.3
	Waterford	12.6	16.4	15.0	11.9	11.2	11.0	9.8	10.4	11.7
	Wexford	2.6	4.1	3.6	2.8	4.2	4.9	4.4	4.1	3.2
HSE-S	**Total**	**13.0**	**13.7**	**14.5**	**13.4**	**13.1**	**14.8**	**15.5**	**14.2**	**13.1**
	Kerry	8.1	10.0	11.2	9.6	7.3	6.4	6.6	6.6	5.7
	North Cork	13.9	12.6	12.3	10.5	8.4	7.7	8.0	9.5	13.6
	North Lee	19.7	20.3	19.6	18.4	21.5	24.3	22.4	19.4	16.5
	South Lee	11.2	13.9	15.8	13.4	12.7	18.5	23.0	19.4	16.7
	West Cork	8.4	4.4	3.8	6.6	7.9	5.1	3.7	7.3	7.6
HSE-W	**Total**	**9.1**	**8.1**	**7.8**	**9.4**	**10.0**	**9.2**	**9.1**	**7.6**	**5.4**
	Galway	6.7	6.4	8.9	10.0	10.3	10.7	8.8	6.6	0.0
	Mayo	7.9	8.4	8.2	8.5	7.3	5.9	5.0	3.5	0.0
	Roscommon	13.9	11.6	14.1	12.8	9.4	9.8	8.0	4.5	0.0
Ireland		**10.0**	**10.3**	**10.4**	**10.3**	**10.6**	**10.9**	**11.2**	**11.0**	**10.3**

[***] 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 420 patients diagnosed with TB in 2010, 246 (58.6%) were born in Ireland, 171 (40.7%) were born outside Ireland and for the remaining three cases (0.7%), the country of birth was unknown. The crude TB rate in the indigenous population was 6.5 per 100,000 population while the crude rate in the foreign-born population was 22.3 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 2010.

Table 11 shows the breakdown of TB cases by HSE area and geographic origin for 2010.

Cases born outside Ireland originated from at least 45 countries. Table 12 shows the breakdown of these cases by country of birth and corresponding continent. Of the 171 cases born outside Ireland, 52.6% were born in Asia, 28.7% were born in Africa, 16.4% were born in Europe and 0.6% in America. The exact country of birth was unknown for three foreign-born cases (1.8%).

Figure 8 shows age-specific rates by geographic origin during 2010. The majority (86.0%) of cases born outside Ireland were aged between 15 and 44 years compared to 38.2% of Irish cases in this age range. The median age among foreign-born cases was 30 years (range: 1-73 years) compared to a median age of 49 years (range: 0-98 years) among Irish born cases.

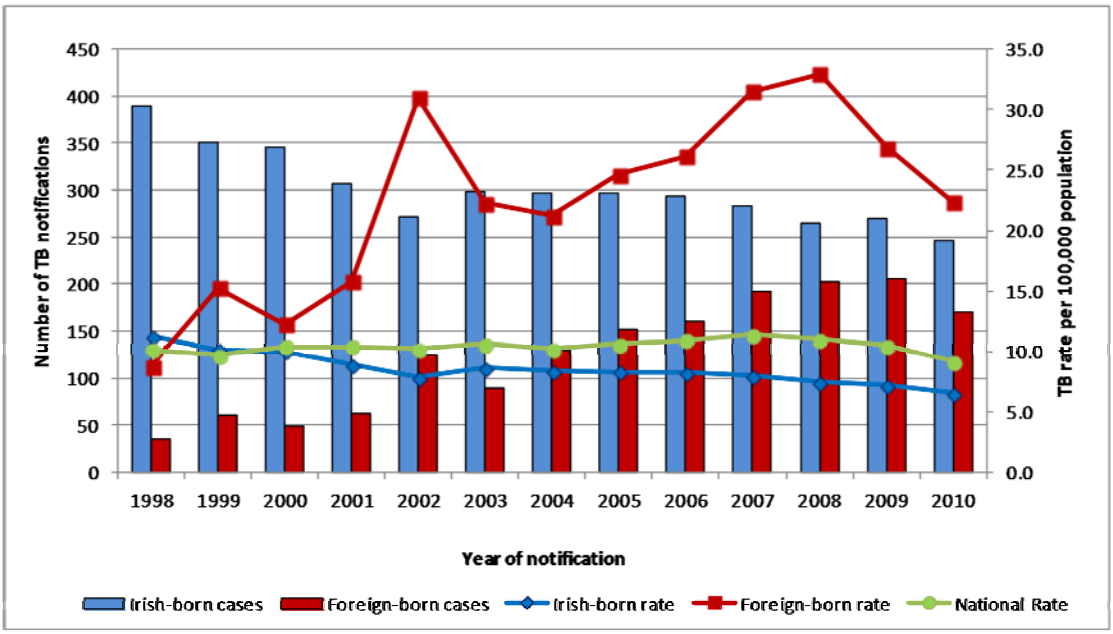

Figure 7: TB cases and rate per 100,000 by geographic origin, 1998-2010

Table 11: TB cases and rates per 100,000 population by HSE area and geographic origin, 2010

HSE Area	Irish-born			Foreign-born			Unknown	Total
	Cases	%	Rate	Cases	%	Rate		
HSE-E	82	*45.6*	***6.4***	95	*52.8*	***31.4***	3	**180**
HSE-M	14	*58.3*	***5.8***	10	*41.7*	***24.1***	0	**24**
HSE-MW	22	*75.9*	***6.9***	7	*24.1*	***13.2***	0	**29**
HSE-NE	19	*63.3*	***5.2***	11	*36.7*	***14.6***	0	**30**
HSE-NW	14	*73.7*	***6.9***	5	*26.3*	***9.8***	0	**19**
HSE-SE	15	*55.6*	***3.5***	12	*44.4*	***17.9***	0	**27**
HSE-S	66	*73.3*	***11.9***	24	*26.7*	***23.9***	0	**90**
HSE-W	14	*66.7*	***3.9***	7	*33.3*	***9.2***	0	**21**
Ireland	**246**	***58.6***	***6.5***	**171**	***40.7***	***22.3***	**3**	**420**

Table 12: Countries of origin of foreign-born patients with TB, 2010

Continent	Total	Country	Number of cases
Africa	49	Angola	1
		Cameroon	1
		Congo	4
		Egypt	1
		Eritrea	1
		Ethiopia	2
		Guinea	1
		Kenya	1
		Malawi	1
		Mauritius	1
		Nigeria	11
		Rwanda	1
		Sierra Leone	2
		Somalia	9
		South Africa	6
		Sudan	1
		Togo	1
		Zambia	1
		Zimbabwe	3
America	1	Brazil	1
Asia	90	Afghanistan	2
		Bangladesh	3
		China	5
		India	26
		Indonesia	1
		Kazakhstan	1
		Malaysia	2
		Nepal	1
		Pakistan	29
		Philippines	13
		Saudi Arabia	1
		Thailand	3
		Timor-Leste	1
		Uzbekistan	1
		Viet Nam	1
Europe	28	Italy	1
		Latvia	2
		Lithuania	7
		Poland	3
		Portugal	1
		Romania	4
		Spain	2
		Turkey	1
		Ukraine	1
		United Kingdom	6
Unknown	3	Unknown - Not Ireland	3
Total			**171**

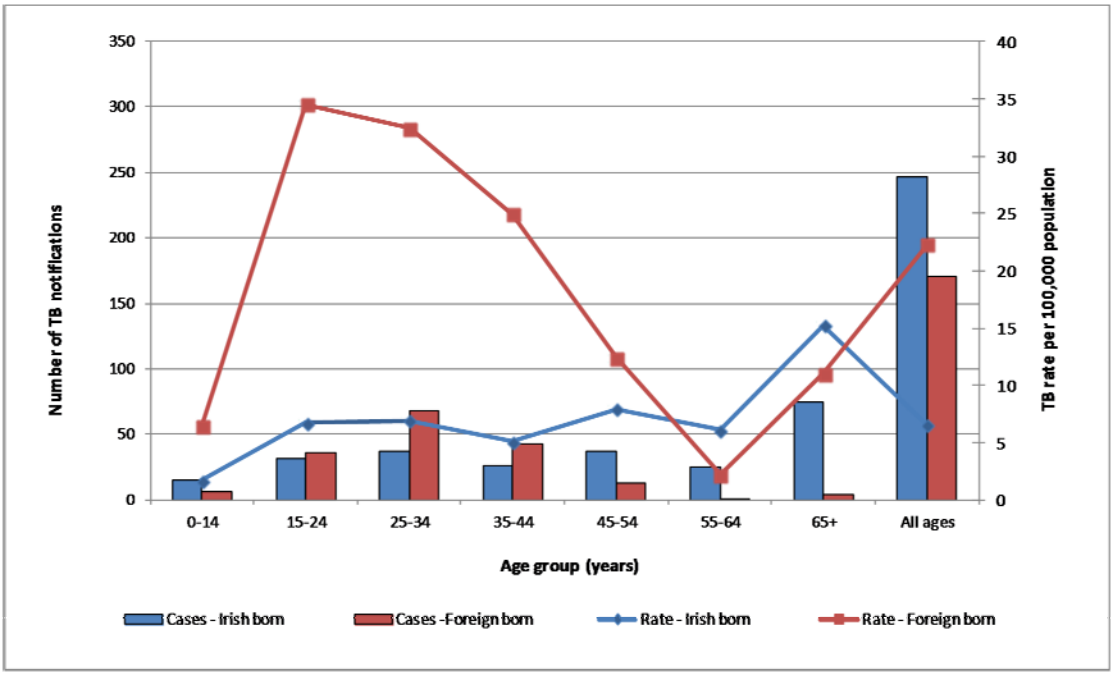

Figure 8: TB cases by age group (years) and age-specific rates by geographic origin, 2010

Site of disease

Of the 420 cases notified in 2010, 242 (57.6%) were pulmonary, 150 (35.7%) were extrapulmonary and 28 (6.7%) were pulmonary and extrapulmonary. TB cases by site of disease and HSE area are shown in table 13.

Table 13: TB cases by site of disease and HSE area, 2010

HSE area	Pulmonary only		Extrapulmonary only		Pulmonary + Extrapulmonary	
	Cases	% of total	Cases	% of total	Cases	% of total
HSE-E	104	*57.8*	62	*34.4*	14	*7.8*
HSE-M	14	*58.3*	9	*37.5*	1	*4.2*
HSE-MW	19	*65.5*	10	*34.5*	0	*0.0*
HSE-NE	20	*66.7*	9	*30.0*	1	*3.3*
HSE-NW	10	*52.6*	9	*47.4*	0	*0.0*
HSE-SE	15	*55.6*	8	*29.6*	4	*14.8*
HSE-S	50	*55.6*	34	*37.8*	6	*6.7*
HSE-W	10	*47.6*	9	*42.9*	2	*9.5*
Total	**242**	***57.6***	**150**	***35.7***	**28**	***6.7***

Pulmonary TB cases

The WHO defines pulmonary TB, for the purpose of analysis, as any case that has a pulmonary disease component. There were 270 cases reported in 2010 with a pulmonary disease component (64.3% of all cases reported). Sputum smear and culture results for these cases are shown in table 14. Sputum microscopy results were available for 174 (64.4%) of the 270 cases. This is a decrease compared to 2009 (75.2%) and is the lowest recorded since 2002 (range 71.3-83.7%).

Of the 270 pulmonary cases, 111 (41.1%) were sputum positive for AFB by microscopy and 206 (76.3%) were culture positive. This compares to 44.3% positive for AFB by microscopy and 77.4% culture positive in 2009. The proportion of pulmonary cases (with or without an extrapulmonary site) was higher in persons born in Ireland (73.6%) compared to those born abroad (50.9%).

Table 14: Sputum smear and culture status for pulmonary TB cases, 2010

Culture result	Sputum smear positive	Sputum smear negative	Sputum smear not done	Sputum smear unknown	Total
Culture positive	104	38	48	16	**206**
Culture negative	1	22	16	3	**42**
Culture not done	2	3	9	2	**16**
Culture not known	4	0	1	1	**6**
Total	**111**	**63**	**74**	**22**	**270**

Extra-pulmonary TB cases

One hundred and fifty cases (35.7%) had exclusively extrapulmonary TB of whom 75 (50.0%) were culture confirmed and 53 (35.3%) were histology positive.

One hundred and seventy-eight (42.4%) of all cases reported in 2010 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 (26.4%) and pleura (16.9%). There were nine cases (5.1% of extrapulmonary cases) of TB meningitis in 2010.

Table 15: Extrapulmonary disease sites in notified cases, 2010[‡‡‡]

Site of disease	Number of cases	Percentage
Lymph (extra-thoracic)	47	26.4
Other	30	16.9
Pleural	30	16.9
Lymph (intra-thoracic)	20	11.2
Bone	10	5.6
Disseminated	9	5.1
Meningeal	9	5.1
Spinal	6	3.4
CNS	5	2.8
Peritoneal	5	2.8
Genitourinary	3	1.7
Abdominal	2	1.1
Renal	1	0.6
Not specified	1	0.6
Total	**178**	100.0

TB meningitis

There were nine cases of TB meningitis reported in 2010 giving an incidence rate of 0.19 per 100,000 population (1.96 per million population). A profile of these cases is provided in table 16. Three of the TB meningitis cases were reported as culture confirmed. Of the nine cases, eight were diagnosed as extrapulmonary and one was diagnosed as pulmonary and extrapulmonary.

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

Table 16: TB meningitis cases in Ireland, 2010

HSE area	Age group (years)	History of BCG	Culture status
HSE-E	65+	Unknown	Negative
HSE-E	65+	Unknown	Negative
HSE-E	25-34	Unknown	Positive
HSE-E	25-34	Unknown	Positive
HSE -MW	25-34	Unknown	Negative
HSE -MW	55-64	Unknown	Negative
HSE -NE	45-54	Unknown	Positive
HSE -NE	25-34	Unknown	Negative
HSE -S	65+	Not vaccinated	Not done

Between 1998 and 2010, a total of 86 cases of TB meningitis have been reported (figure 9). The cumulative incidence rates of TB meningitis in each HSE area and in Ireland for 1998-2010 are shown in table 17. The highest cumulative rate of TB meningitis between 1998 and 2010 is in HSE South (3.7 per 100,000).

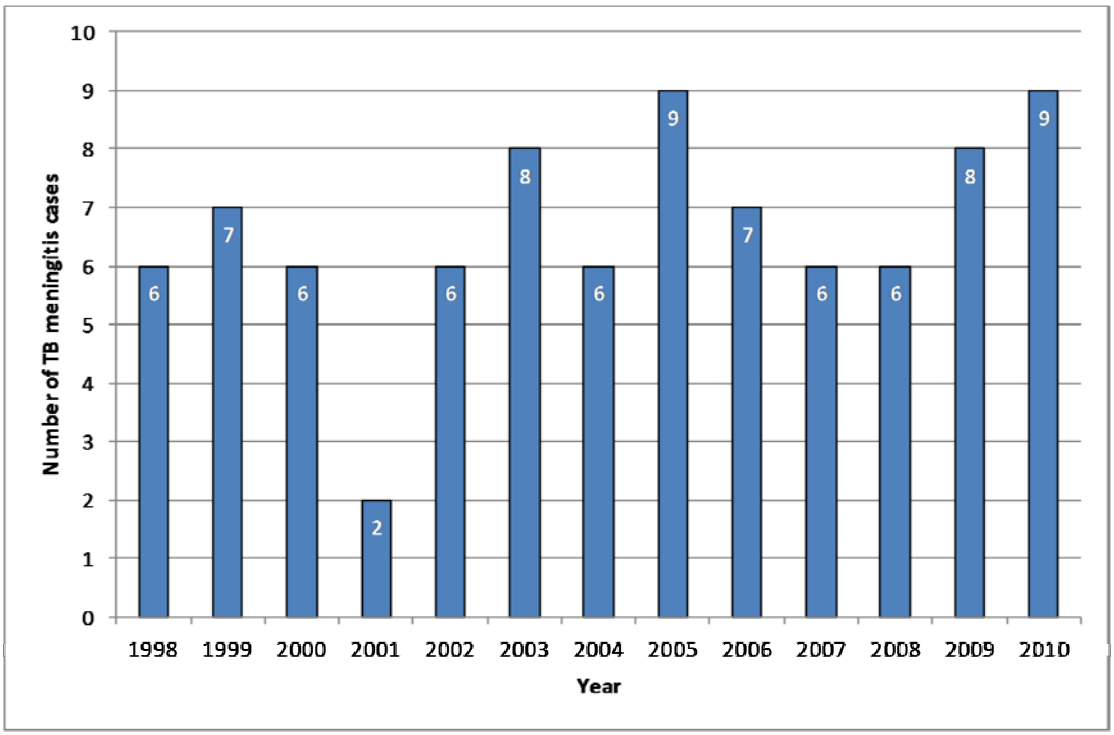

Figure 9: Number of TB meningitis cases, 1998-2010

Table 17: Cumulative incidence rate of TB meningitis in Ireland, 1998-2010

HSE area	Cases 1998 to 2010	Cumulative incidence rate (per 100,000)[§§§]	95% CI
HSE-E	30	2.0	1.3 - 2.7
HSE-M	0	0.0	0 - 0
HSE-MW	8	2.2	0.7 - 3.8
HSE-NE	10	2.5	1 - 4.1
HSE-NW	4	1.7	0 - 3.3
HSE-SE	6	1.3	0.3 - 2.3
HSE-S	23	3.7	2.2 - 5.2
HSE-W	5	1.2	0.1 - 2.3
Ireland	**86**	**2.0**	**1.6 - 2.5**

The highest cumulative age specific rates of TB meningitis between 1998 and 2010 were reported in the 25-34 year age group (3.3/100,000) followed by those aged 65 years and older (2.6/100,000) while the lowest rates were reported in the 45-54 year age group (0.6/100,000) 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 2010.

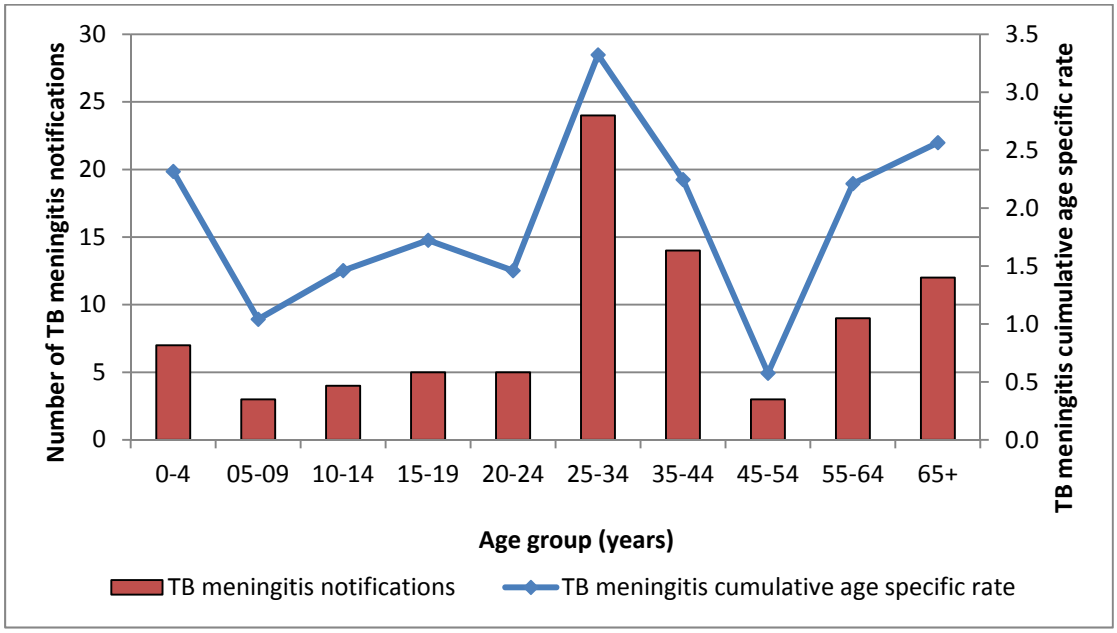

Figure 10: Cumulative number of TB meningitis notifications by age group and cumulative age specific rate, 1998-2010

[§§§] *Note: Calculations based on 2006 census figures*

Bacteriological results

Of the 420 cases notified in 2010, 324 (77.1%) were laboratory confirmed by culture, microscopy or histology.

Of the 270 cases with a pulmonary component, 219 (81.1%) were laboratory confirmed (by culture, microscopy or histology) and of the 150 cases with exclusively extrapulmonary disease, 105 (70.9%) were laboratory confirmed (by culture, microscopy or histology).

Culture

In 2010, 281 (66.9%) of all TB cases notified were culture positive. This is a decrease compared to the percentage reported in 2009 (71.2%). Table 18 shows a breakdown by culture status and HSE area of TB cases notified in 2010 while figure 11 shows the number of TB notifications and percentage culture positive by year, 2002 to 2010.

Of the 270 cases with a pulmonary component, 206 (76.3%) were culture confirmed, a slight decrease from 77.4% reported in 2009. For new[****] cases with a pulmonary component, 164 (77.4%) were culture confirmed, a decrease compared to 80.1% reported in 2009.

Of the 150 cases with exclusive extrapulmonary disease, 75 (50.0%) were culture confirmed, a decrease compared to 59.8% reported in 2009.

Table 18: Culture status of TB cases by HSE area, 2010

HSE area	Positive	Negative	Not done	Unknown	Total
HSE-E	132	26	22	0	**180**
HSE-M	14	8	2	0	**24**
HSE-MW	17	10	2	0	**29**
HSE-NE	19	5	0	6	**30**
HSE-NW	14	4	1	0	**19**
HSE-SE	19	6	2	0	**27**
HSE-S	51	17	18	4	**90**
HSE-W	15	4	2	0	**21**
Ireland	**281**	**80**	**49**	**10**	**420**

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

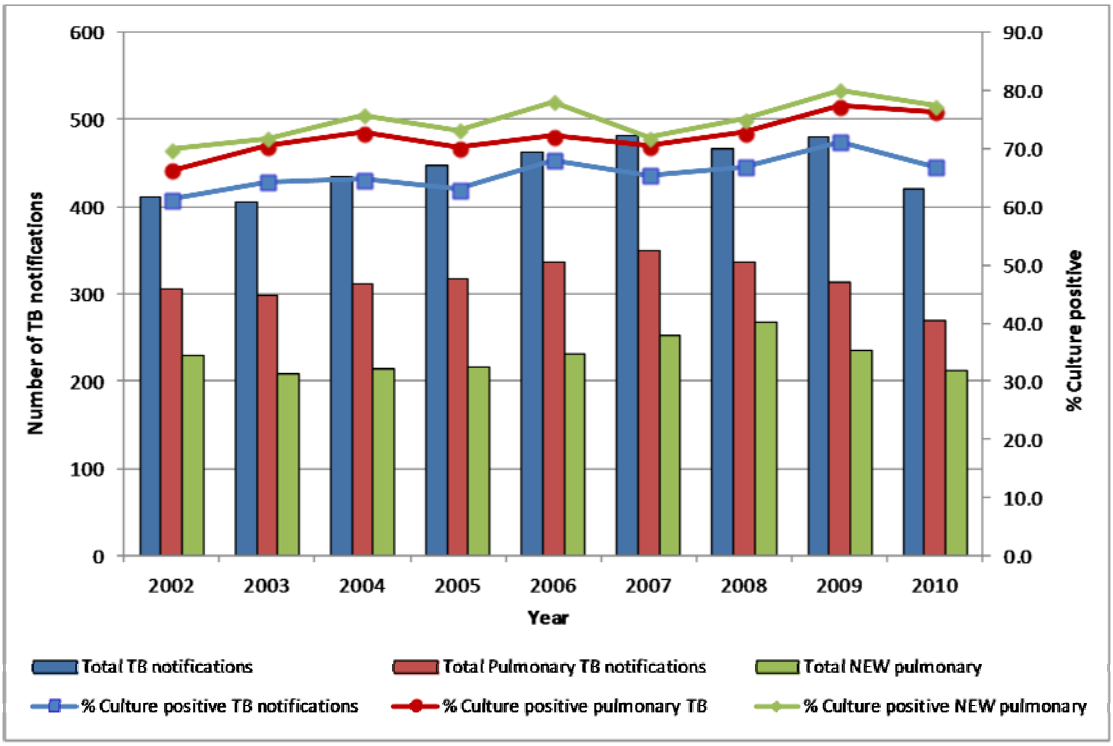

Figure 11: Number of TB notifications and percentage culture positive by year, 2002-2010

Species

Information on species was reported for 280 (99.6%) of the 281 culture confirmed cases. Of the cases where species was reported, 265 (94.6%) were *M. tuberculosis*, 12 (4.3%) were *M. bovis* and three (1.1%) were *M. africanum.*

Of the 12 *M. bovis* cases notified during 2010, all were born in Ireland and none had a previous history of TB reported. Six cases reported having one or more risk factor for TB, including contact with a case of TB, anti-TNF medication, diabetes, raw milk consumption, alcohol misuse and occupation. Six cases were aged between 55-64 years. Four cases had mono-resistance to isoniazid.

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 2002-2010

Year	*M. africanum*		*M. bovis*		*M. tuberculosis*		Species Unk	
	N	%	N	%	N	%	N	%
2002	0	*0.0*	7	*2.8*	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*
2010	3	*1.1*	12	*4.3*	265	*94.3*	1	*0.4*
Total	**9**	***0.3***	**62**	***2.4***	**2527**	***95.8***	**40**	***1.5***

Anti-TB drug resistance[††††]

Information on the results of drug sensitivity testing (DST) was reported for 275 (97.9%) of the 281 culture confirmed cases, an increase compared to the proportion reported in 2009 (94.7%). The proportion of culture confirmed cases with DST results reported was 98.8% for new pulmonary cases and 100.0% 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 2002-2010

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
2010	97.9	98.8	100.0	100.0
Mean	**95.0**	**96.3**	**93.9**	**93.5**

Of the 275 cases where sensitivity results were reported, resistance was documented in 26 cases (9.5%; 6.2% of total cases), including two cases of MDR-TB (0.7%; 0.5% of total cases). Mono-resistance to isoniazid was recorded in 10 cases (4 *M. bovis*), to rifampicin in two cases, pyrazinamide in one case, to ethambutol in one case and to streptomycin in five cases. Three cases were resistant to isoniazid and streptomycin, one was resistant to pyrazinamide and ethambutol while one further case was resistant to isoniazid, pyrazinamide, ethambutol and streptomycin. Details of resistant cases are summarised in table 21.

Of the 26 drug resistant cases 16 (61.5%), including both MDR-TB cases, were foreign born (figure 12). Twenty-two of the 26 drug resistant cases had no previously recorded history of TB, three had a previously documented history of TB while previous TB history was unknown for the remaining drug resistant case (figure 13). There were no XDR-TB cases reported in Ireland during 2010.

A summary of drug resistance in 2010 is shown in table 21 and the drug sensitivity results of the MDR-TB cases are shown in table 22 while figure 14 shows the number of MDR-TB notifications, rate per 100,000 population and 3 year moving average by year.

[††††] 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, 2010

DST results	Number of cases	% of culture confirmed cases
Cases with DST results	275	97.9
Resistant cases	26	9.3
MDR-TB	2	0.7
Mono-resistance to Isoniazid	10	3.6
Mono-resistance to Rifampicin	2	0.7
Mono-resistance to Pyrazinamide	1	0.4
Mono-resistance to Ethambutol	1	0.4
Mono-resistance to Streptomycin	5	1.8
Cases resistant to Isoniazid and Streptomycin	3	1.1
Cases resistant to Pyrazinamide and Ethambutol	1	0.4
Cases resistant to Isoniazid, Pyrazinamide, Ethambutol and Streptomycin	1	0.4

Table 22: Sensitivity results of MDR-TB cases, 2010

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

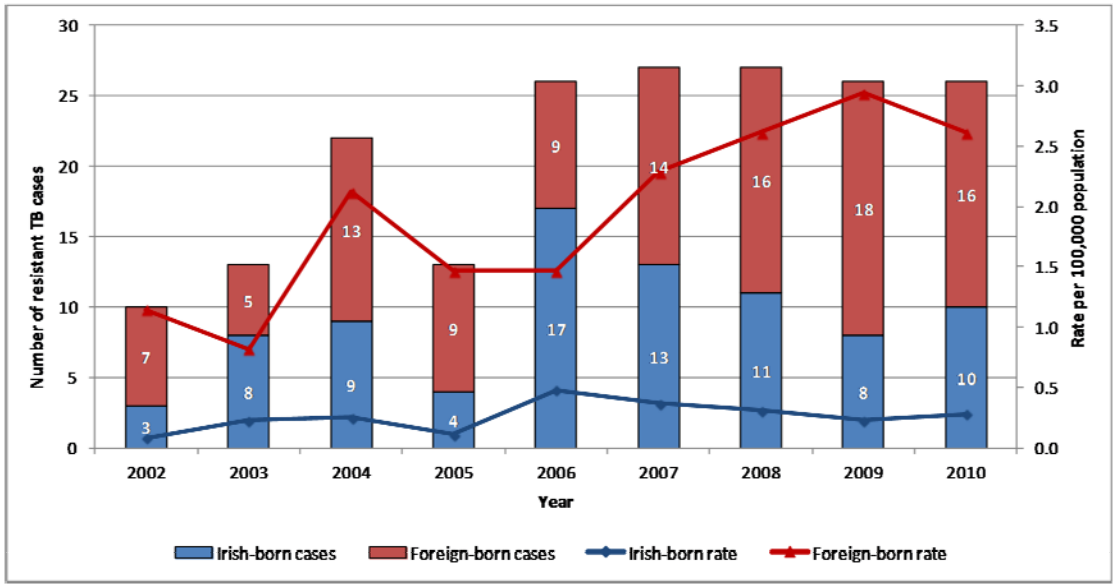

Figure 12: Number and rate of TB notifications with resistance to any first line anti-TB drug by geographic origin and year 2002-2010

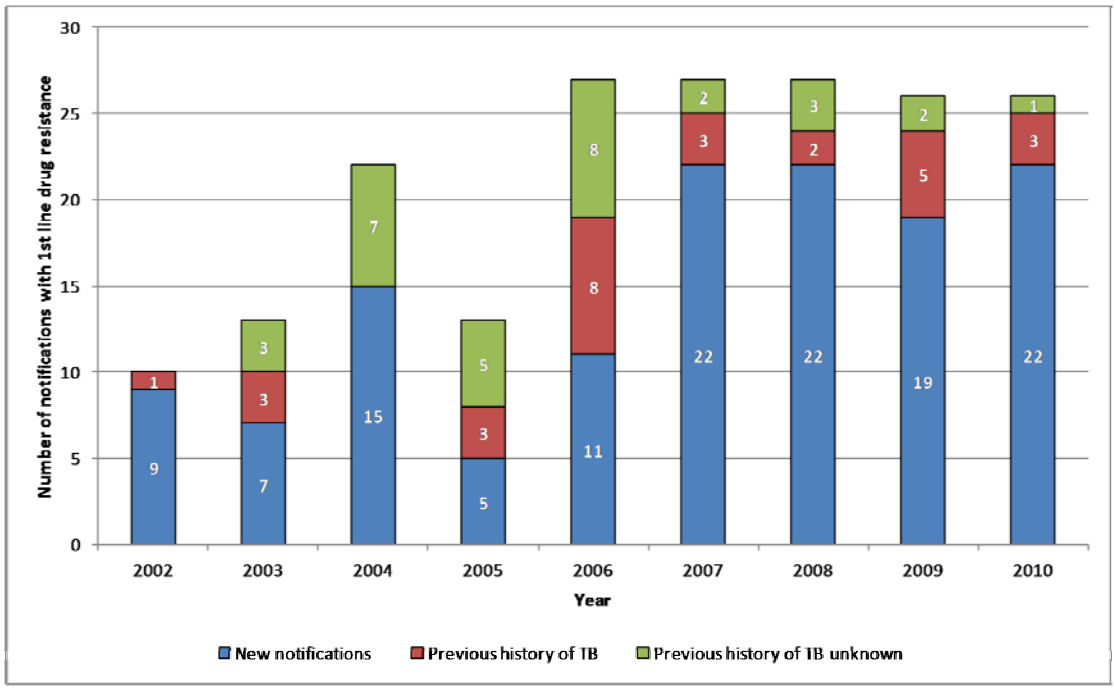

Figure 13: Number of TB notifications with resistance to any first line anti-TB drug by previous history of TB and year 2002-2010

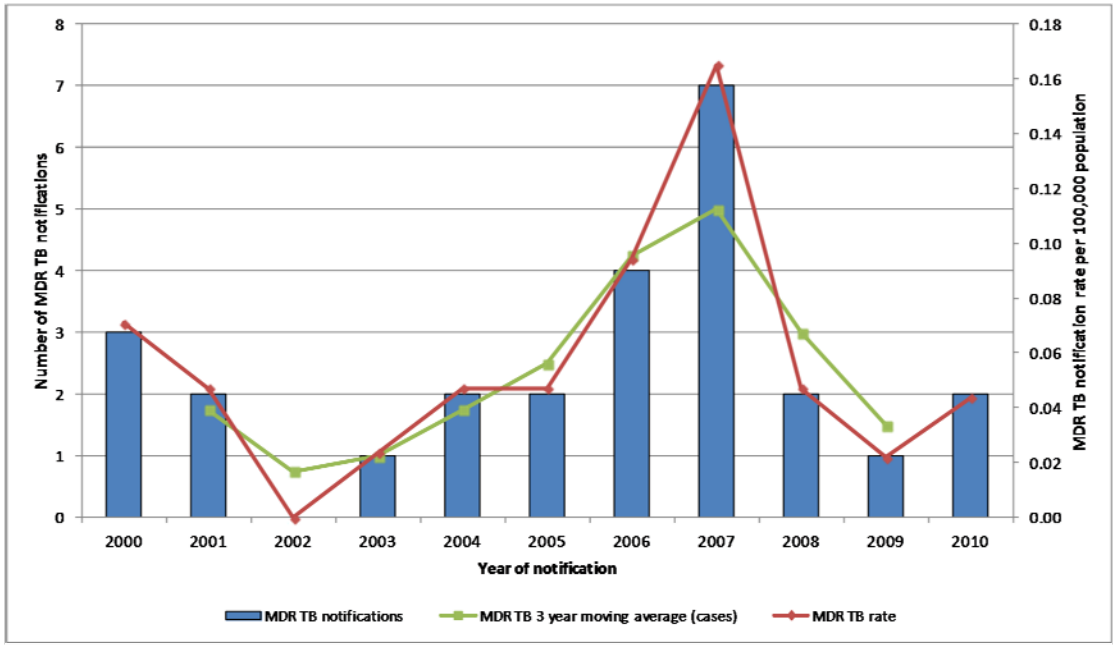

Figure 14: Number of MDR notifications, rate per 100,000 population and 3 year moving average by year 2000-2010

Case classification

Using the case definitions (described in the Methods section), TB cases notified in 2010 can be classified into confirmed, probable and possible cases as outlined in Table 23. Of the 420 cases notified, 281 (66.9%) were confirmed, 43 (10.2%) were probable and 96 (22.9%) were possible cases.

Table 23: Case classification of TB cases by site of disease, 2010

Site of disease	Confirmed		Probable		Possible		Total
	Cases	%	Cases	%	Cases	%	
Pulmonary	185	76.4	11	4.5	46	19.0	**242**
Pulmonary + Extrapulmonary	21	75.0	2	7.1	5	17.9	**28**
Extrapulmonary	75	50.0	30	20.0	45	30.0	**150**
Total	**281**	**66.9**	**43**	**10.2**	**96**	**22.9**	**420**

Treatment outcome

Outcome was recorded for 370 (88.1%) of the 420 cases notified in 2010, an increase compared to 82.3% in 2009 (figure 15). Of the 370 cases, 304 completed treatment, 27 died, 30 were recorded as being lost to follow up, treatment was interrupted in seven cases and two cases were still on treatment at the time of reporting. Of the 27 deaths reported, eight (1.9% of total cases) were attributed to TB.

Outcome was reported for 96 (86.5%) of the 111 smear positive cases. Of the 96, 79 completed treatment, nine died, six were lost to follow up, treatment was interrupted in two cases at the time of reporting. Of the nine deaths among smear positive cases, two 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, 21 (80.8%) completed treatment, two were lost to follow up and treatment outcome was unknown in three cases.

One MDR-TB case was reported in 2009, which completed treatment. Treatment outcomes for the MDR-TB cases reported during 2010 are 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, 2010

Treatment outcome	Total		Smear Positive	
	Number	%	Number	%
Completed	304	72.4	79	71.2
Lost to follow up	30	7.1	6	5.4
Died (not attributed to TB)	16	3.8	6	5.4
Still on treatment	2	0.5	0	0.0
Died (attributed to TB)	8	1.9	2	1.8
Interrupted (>2mths)	7	1.7	2	1.8
Died (cause unknown)	3	0.7	1	0.9
Unknown	50	11.9	15	13.5
Total	**420**	**100.0**	**111**	**100.0**

Table 25: Treatment outcome by HSE area, 2010

		Outcome known	Outcome unknown	Lost to follow up	Total
HSE E	**Number**	140	20	20	**180**
	%	*77.8*	*11.1*	*11.1*	*100.0*
HSE M	**Number**	22	0	2	**24**
	%	*91.7*	*0.0*	*8.3*	*100.0*
HSE MW	**Number**	16	13	0	**29**
	%	*55.2*	*44.8*	*0.0*	*100.0*
HSE NE	**Number**	20	9	1	**30**
	%	*66.7*	*30.0*	*3.3*	*100.0*
HSE NW	**Number**	17	0	2	**19**
	%	*89.5*	*0.0*	*10.5*	*100.0*
HSE SE	**Number**	26	0	1	**27**
	%	*96.3*	*0.0*	*3.7*	*100.0*
HSE S	**Number**	78	8	4	**90**
	%	*86.7*	*8.9*	*4.4*	*100.0*
HSE W	**Number**	21	0	0	**21**
	%	*100.0*	*0.0*	*0.0*	*100.0*
National	**Number**	**340**	**50**	**30**	**420**
	%	***81.0***	***11.9***	***7.1***	***100.0***

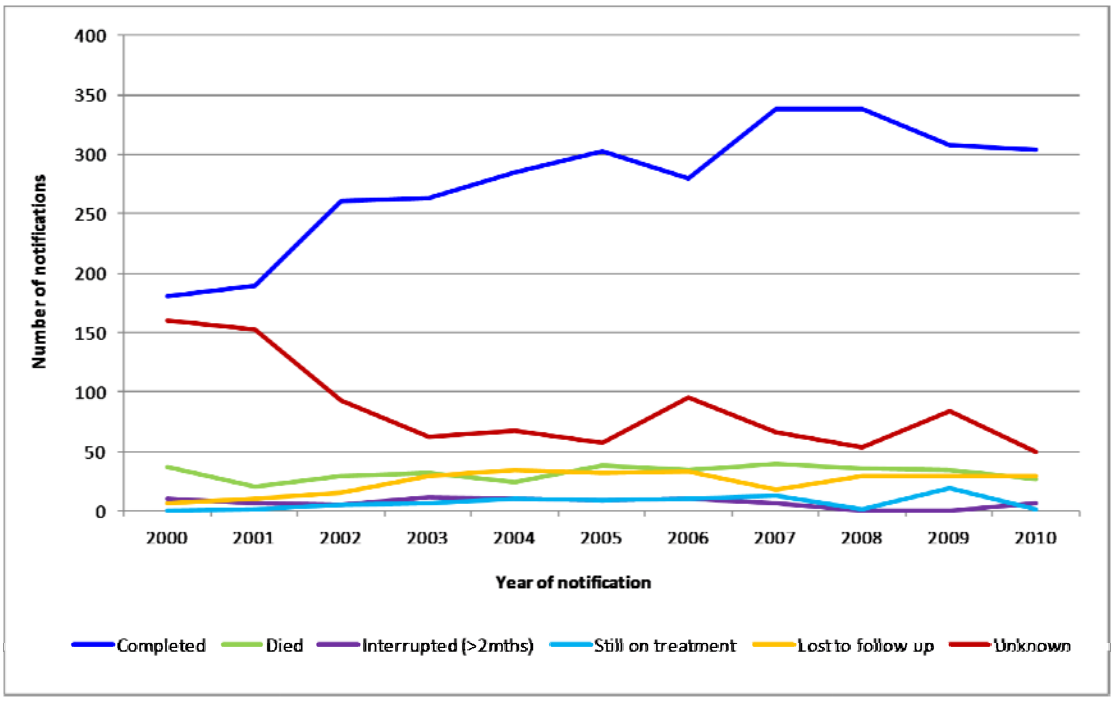

Figure 15: TB notifications by treatment outcome and year 2000-2010

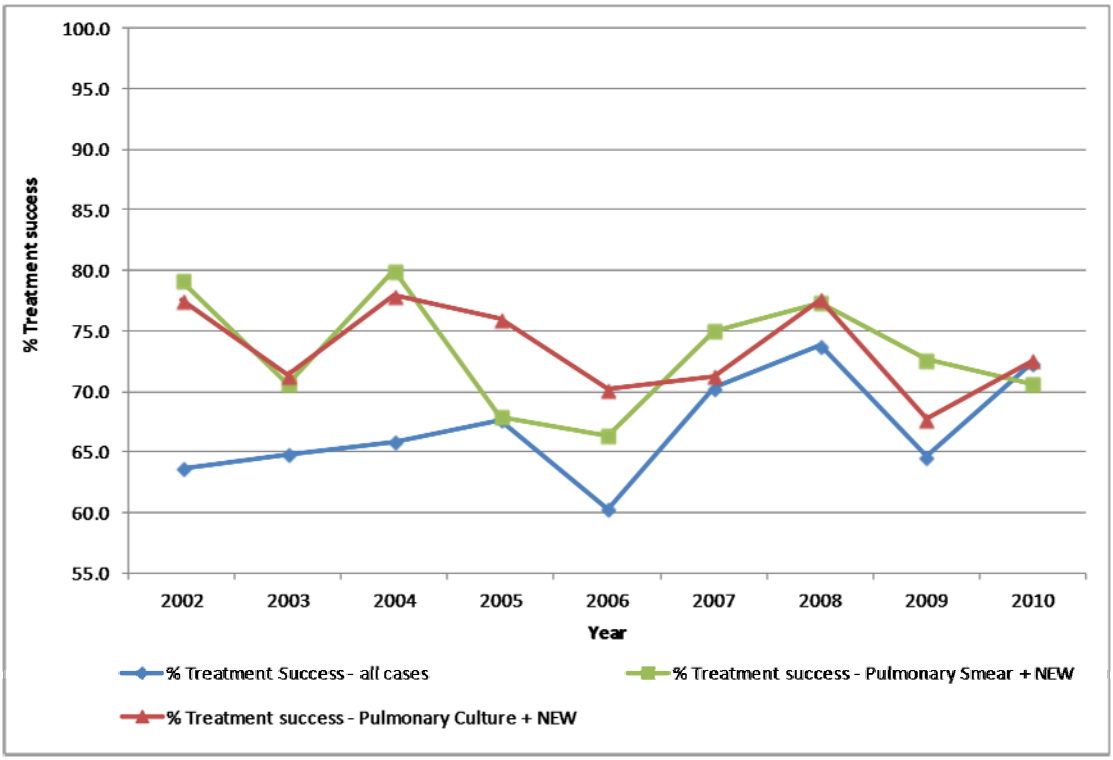

Figure 16: TB notifications by treatment success and year 2002-2010

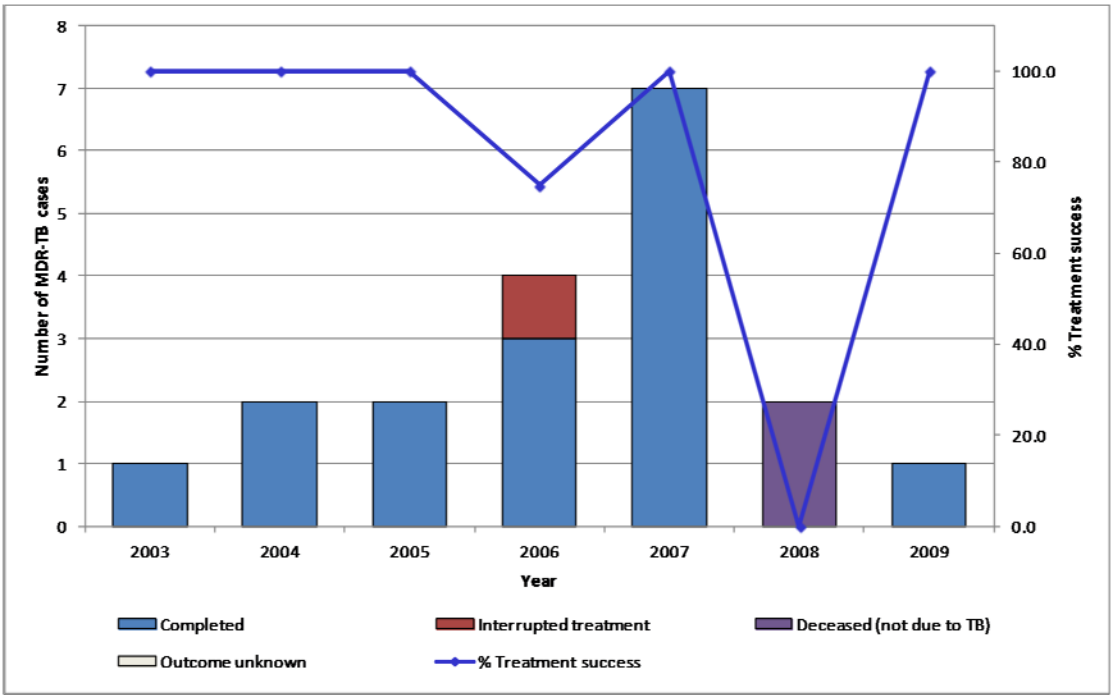

Figure 17: Number of MDR-TB notifications by treatment outcome and percentage treatment success by year, 2003-2009

Case ascertainment

Table 26 summarises the method by which cases notified in 2010 were found. The majority (81.4%) presented as a case with a further 6.9% found by contact tracing.

Table 26: Method of case finding, 2010

Case found by	Number of cases	Percentage
Presenting as case	342	81.4
Contact tracing	29	6.9
Other	17	4.0
Other screening	8	1.9
Immigrant screening	3	0.7
Unknown	21	5.0
Total	**420**	**100.0**

Previous history of TB

Thirty-three (7.9%) of the 420 cases were reported to have a previous history of TB. The previous year of diagnosis was provided for 26 cases and ranged from 1940 to 2009 with 15 of the 26 cases (57.7%) reported to have had TB in the previous ten years.

Of the 33 cases with a previous history of TB, 18 reported having been treated for TB and six cases reported not being treated for TB (including three cases where previous year of diagnosis was prior to the introduction of TB medication) and previous treatment was unknown for the remaining nine cases.

Of the 18 cases who were previously treated for TB, eight cases (44.4%) were reported as having completed treatment, two (11.1%) did not complete treatment and previous treatment outcome was not reported for the remaining eight cases (44.4%).

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

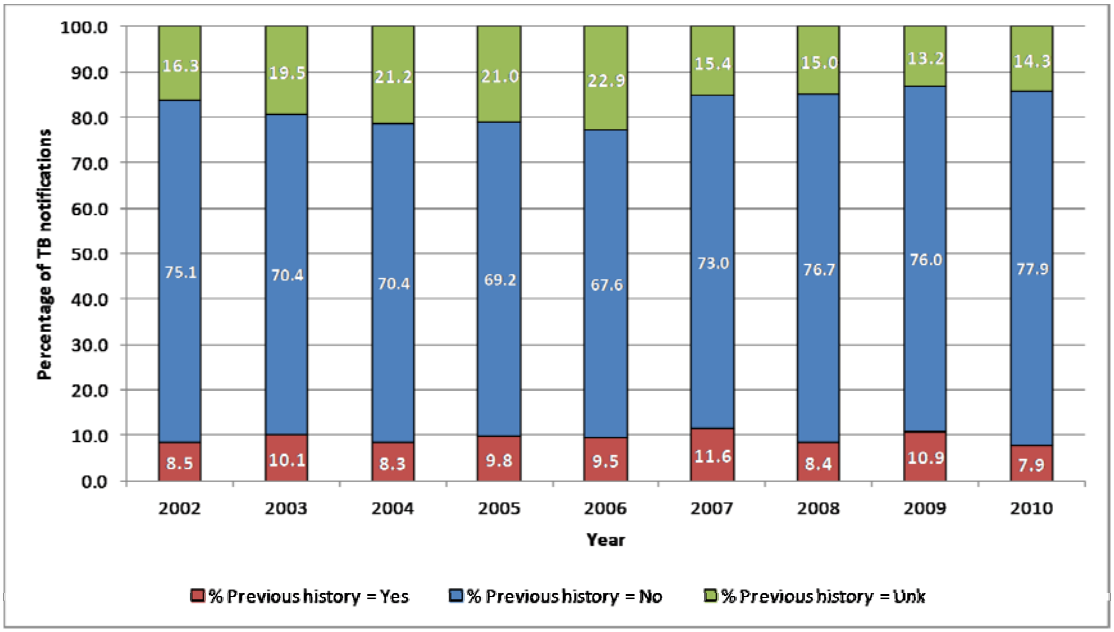

Figure 18: TB notifications by previous history of TB disease and year 2002-2010

TB Risk groups

During 2010, information on TB risk factors was reported for 340 (81.0%) cases which remains stable in comparison to the proportion reported in 2009 (81.4%). Of the 340 cases, 130 (38.2%) were reported as not having a risk factor for TB while 210 (61.8%) 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=92, 43.8%), followed by substance misuse (n=32, 15.2%), co-morbidity with an immunosuppressive illness (n=27, 12.9%) and contact with a case of TB (n=23, 11.0%). Other risk factors reported included treatment with immunosuppressive medication (n=5, 2.4%), co-morbidity with diabetes (n=6, 2.9%) and treatment with anti-TNF medications (n=4, 1.9%). A further 58 (27.6%) cases reported other or unspecified TB risk factors. Other TB risk factors reported included various co-morbidities (including malignancies (n=7), respiratory illness (n=6) and auto-immune disorders (n=1)), occupation (n=11) tobacco use (n=8), previous history of TB (n=6), previous consumption of unpasteurised milk (n=2) and homelessness (n=1).

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

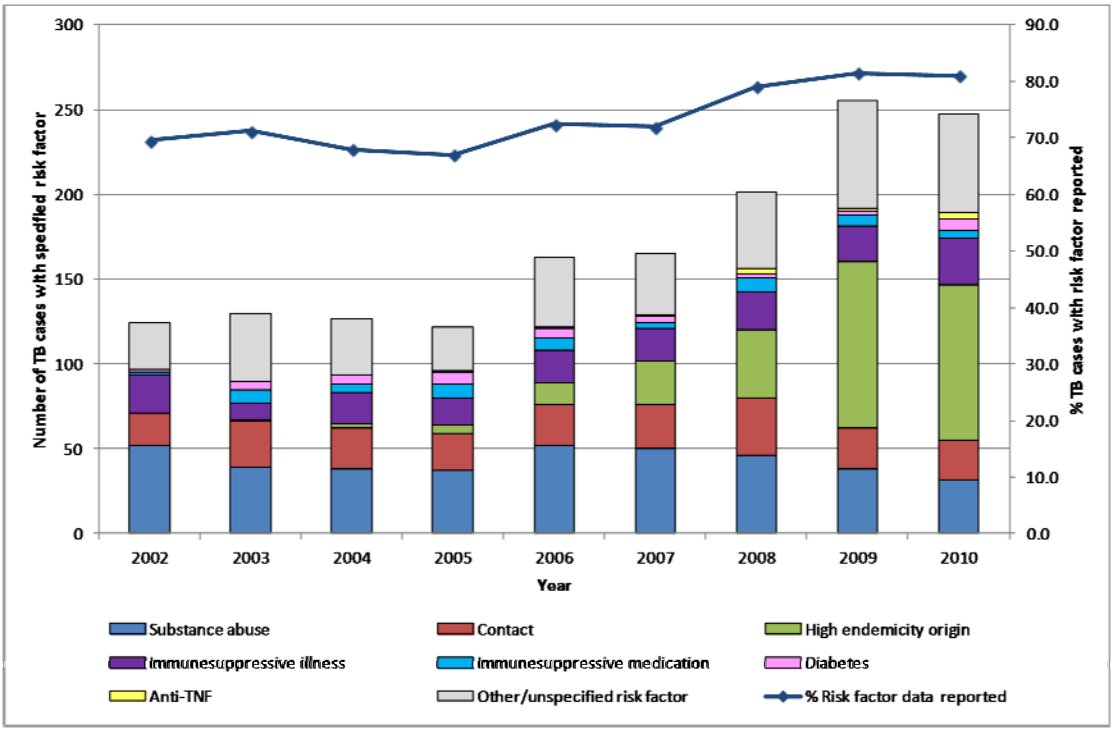

Figure 19: Number of TB notifications with a TB risk factor reported and percentage of TB cases with risk factor data reported, 2002-2010

HIV status

Fifteen of the 420 cases (3.6%) notified in 2010 were reported as HIV positive while 83 (19.8%) were reported as HIV negative. Information on HIV status was not reported or was unknown for 322 (76.7%) of cases during 2010, a slight increase from 71.6% of cases with HIV status unknown in 2009 (Figure 20).

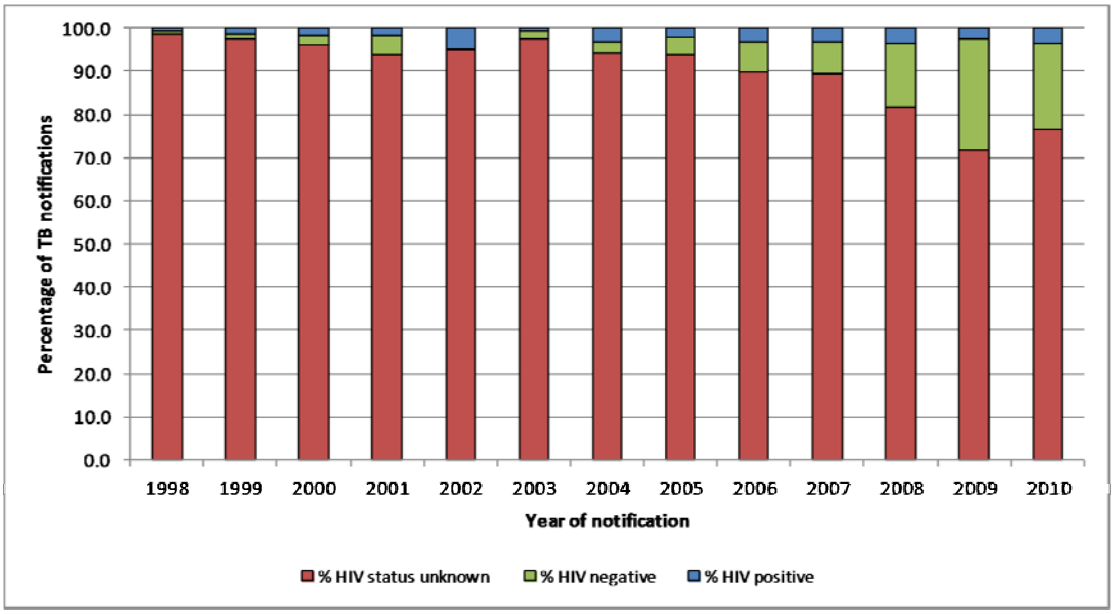

Figure 20: Percentage of TB notifications by HIV status and year, 1998-2010

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 2010, seven outbreaks of TB were reported to HPSC, with 41 associated active cases of TB, 60 cases of latent TB infection (LTBI) and 20 hospitalisations (figure 21). Two outbreaks were reported by HSE-M and five by HSE-S (figure 22).

There were five general outbreaks during 2010, three of which occurred in schools, one was in a community setting and one was in a workplace. There were also two family outbreaks, both of which occurred across extended families (figure 23).

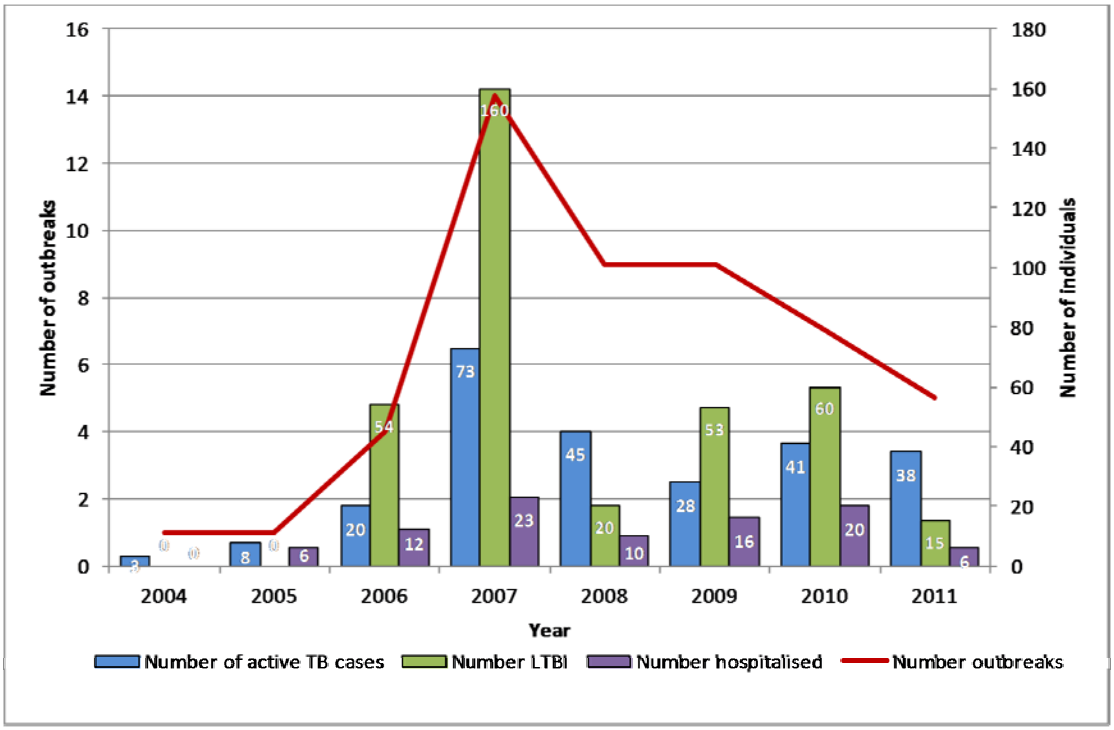

Figure 21: TB outbreak summary by year, 2004-2011

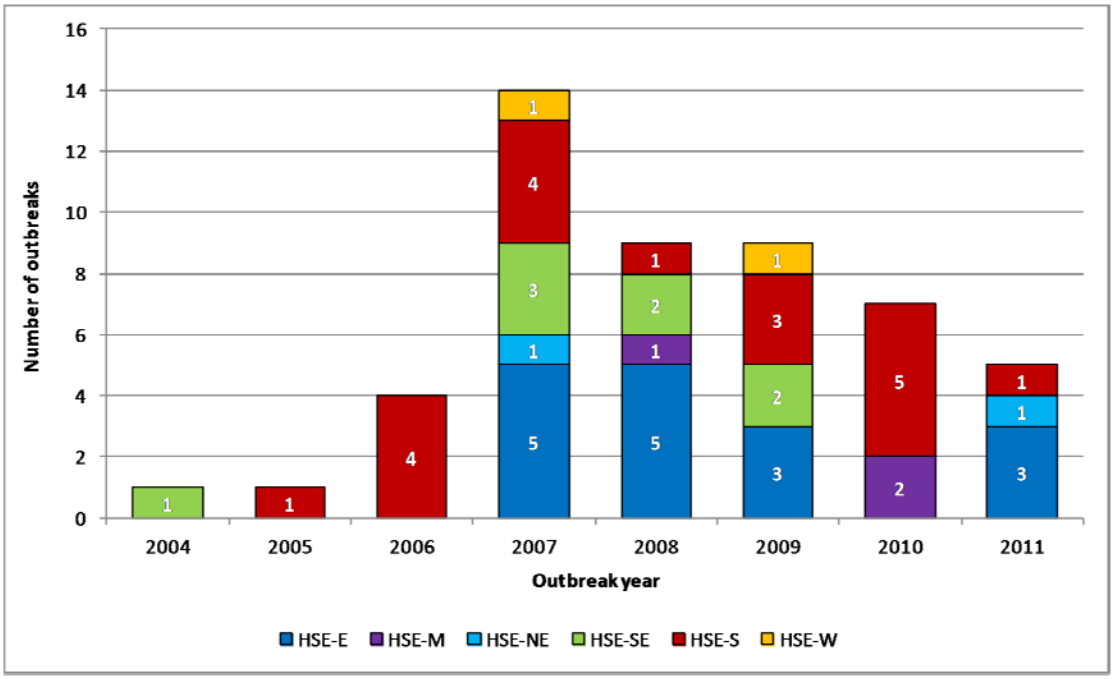

Figure 22: Number of TB outbreaks by HSE area and year, 2004-2011

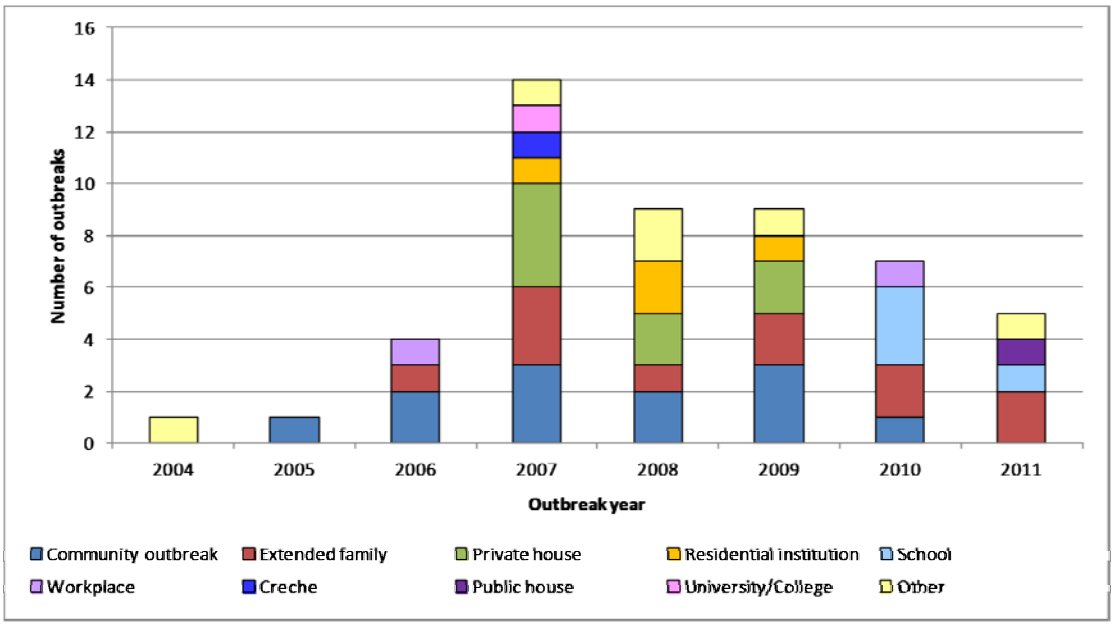

Figure 23: Number of TB outbreaks by location and year, 2004-2011

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 2010.

Table 27: WHO Stop TB target summary

WHO Stop TB target summary	2010 Irish notifications (%)	2015 WHO Target (%)
Percentage of patients with DST results – new cases‡‡‡‡	67.3	100.0
Percentage of patients with DST results – previously treated cases§§§§	72.7	100.0
Treatment success rate – total notifications	72.4	90.0
Percentage of cases with a HIV test result	23.3	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*.[10] 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 2010 cohort.

‡‡‡‡ *Roadmap to prevent and combat drug resistant tuberculosis,*[9] 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,*[9] 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	2010 Irish notifications (%)	ECDC Target (%)
Percentage of new pulmonary cases culture confirmed	77.4	80.0
Percentage of new pulmonary culture confirmed cases with DST results	98.8	100.0
Treatment success rate – new pulmonary culture confirmed cases	72.6	85.0
Percentage of cases with a HIV test result	23.3	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 2007 and 2011, the mean annual percentage change in the TB crude notification rate in Ireland was -0.3%. However, further analysis showed that this was not statistically significant, indicating that the trend in the TB crude notification rate remains stable over this five year period (figure 24).

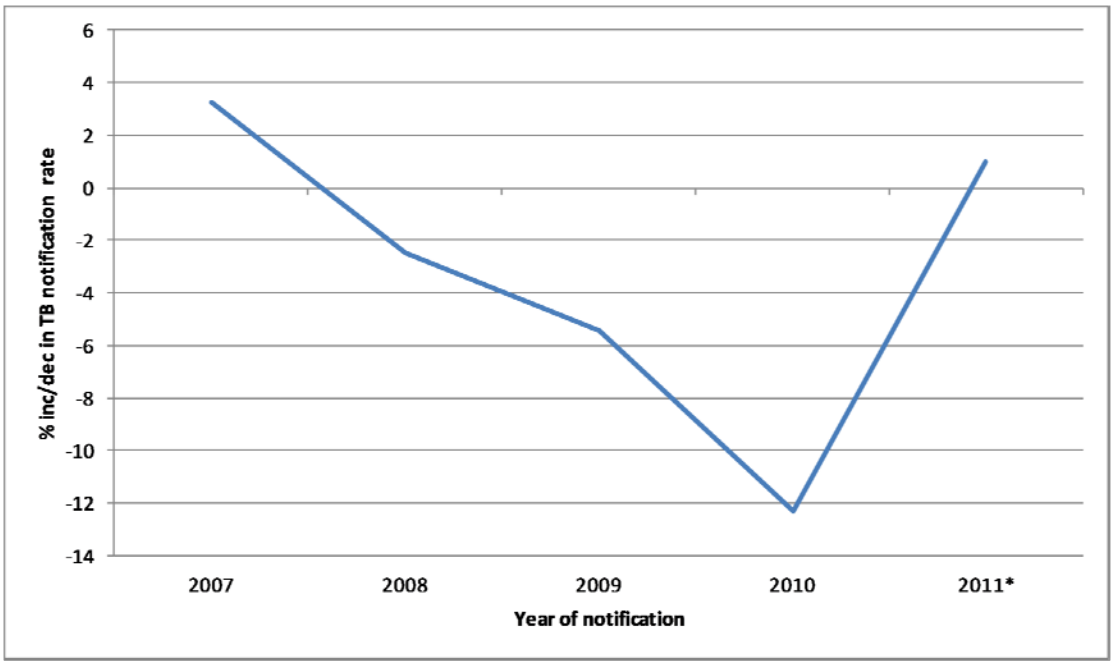

Figure 24: Percentage increase/decrease in TB crude notification rate per 100,000 population, 2007-2011[*****]

[*****] 2011 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 2002 and 2011, the Irish mean annual percentage change in the mean age of total TB notifications was -0.4 (figure 25). Further analysis showed that the decrease in mean age was not statistically significant, indicating an that the mean age remained stable during this time period.

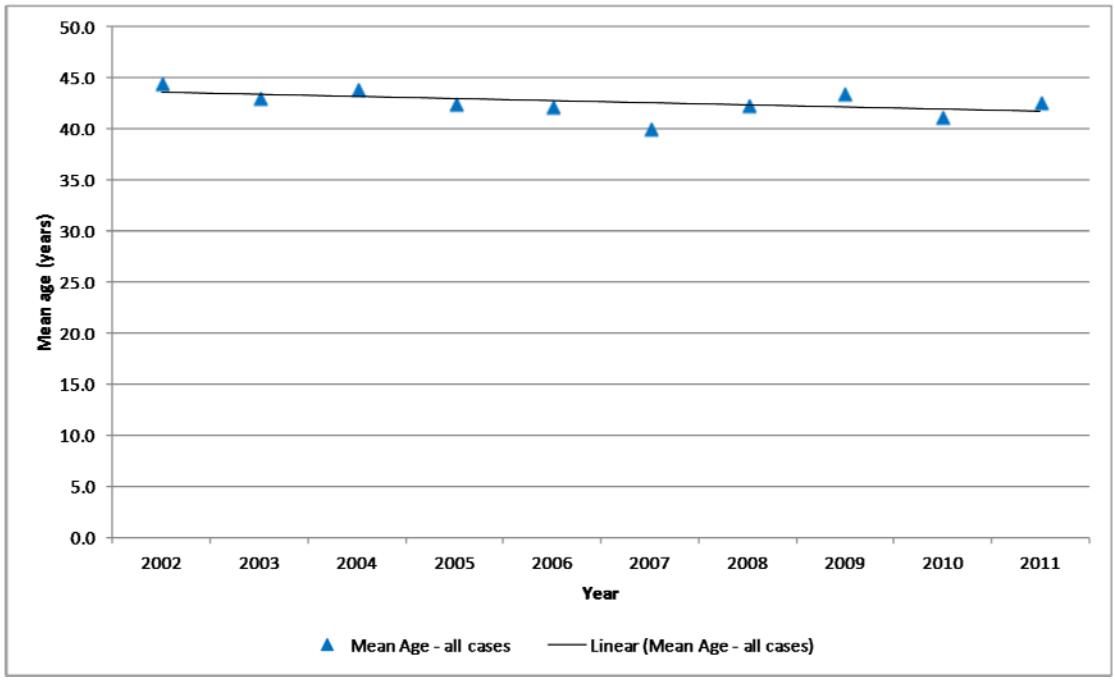

Figure 25: Mean age of TB notifications by year, 2002-2011

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 2002 and 2011 was 22.3%. However, further analysis showed that this was not statistically significant (figure 26).

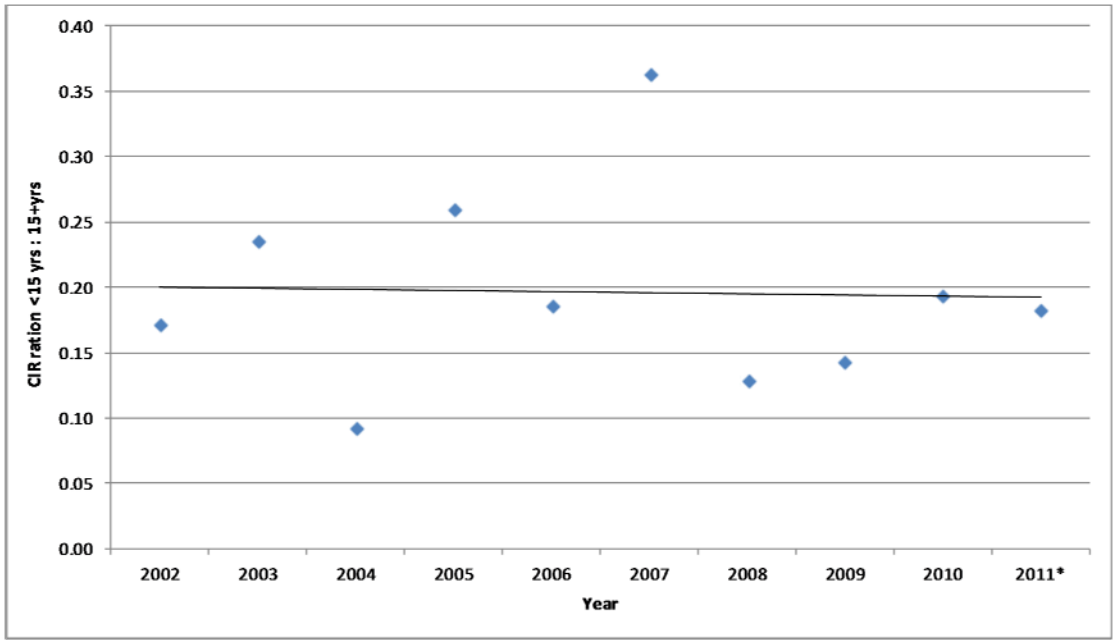

Figure 26: Ratio of paediatric to adult TB notification rates by year, 2001-2011

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 2007 and 2011, the mean annual percentage change in the Irish MDR-TB notification rate was 10.4% (figure 27). However, further analysis showed that this was not statistically significant. Provisional data for 2011 and 2012 indicate that numbers of MDR-TB cases have stabilised since 2008 to a low level with an average of 2.6 cases per annum. Due to the very small numbers involved, these data should be interpreted with caution.

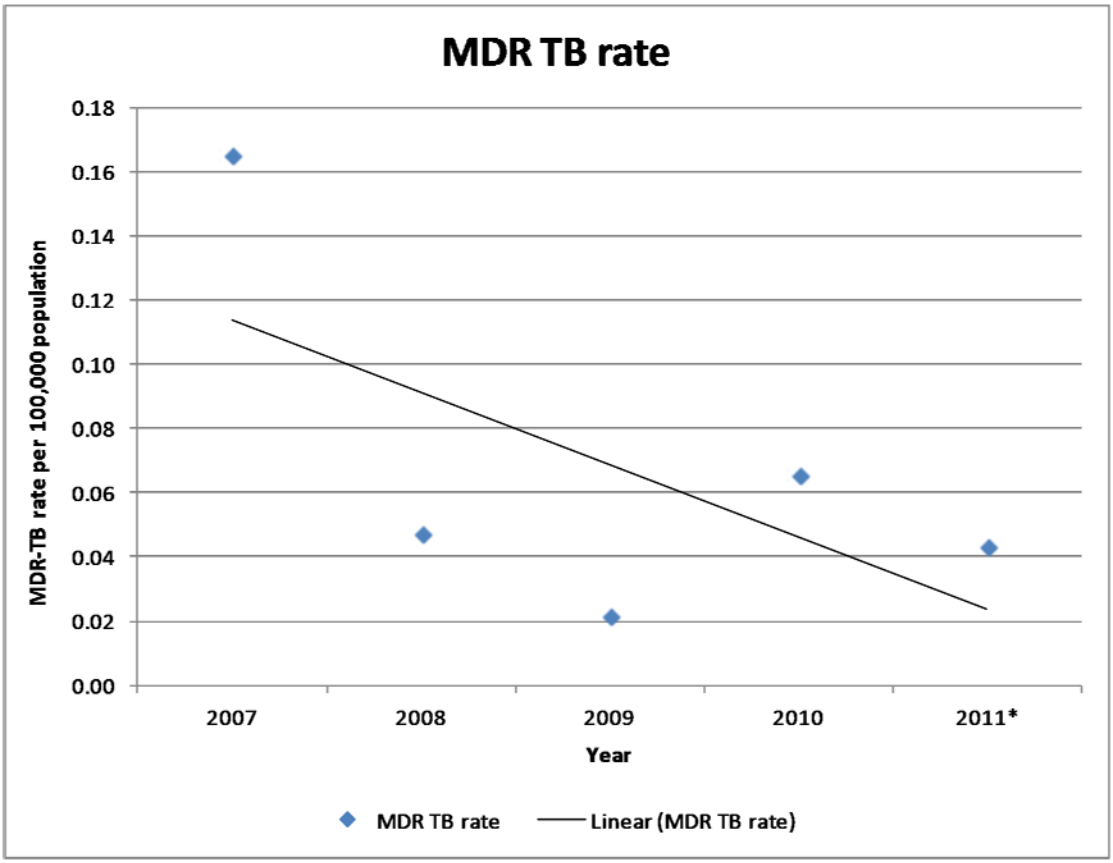

Figure 27: MDR-TB notification rates by year, 2007-2011

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

In 2010, 420 cases of TB were notified to HPSC, a national crude incidence rate of 9.2 per 100,000 population. This is a decrease compared to 2009 (10.4 per 100,000) and the lowest crude rate recorded since TB surveillance began in 1998. The overall notification rate in countries of the EU and Western Europe who report to ECDC was 14.6 per 100,000 population in 2010, ranging from 4.3 per 100,000 population in Greece to 98.2 per 100,000 in Romania.[2]

Differences in age-standardised TB incidence rates persist between HSE areas. In 2010, HSE South and HSE East reported the highest rates. HSE West and HSE South East had the lowest rates. Certain local health offices (LHOs) were found to have particularly high rates of TB incidence including Dublin North Central and Dublin South City in HSE East, and North Cork and South Lee in HSE South. According to the 2011 Census, between 23-27% of the population in Dublin city and Cork city belong to social class 6 and 7 (see Appendix 3 for descriptions of social class).[7]

During 2010, 40.7% of TB cases notified were foreign born. This proportion has steadily increased since 2003 (21.9%) and compares to 43.0% in 2009. In 2010, among countries in the EU and Western Europe who reported data to ECDC, 25.1% of notifications were in foreign-born patients. In Austria, Belgium, Slovakia and Slovenia, where crude incidence rates are similar to those reported in Ireland, the percentage of cases of foreign origin in 2010 ranged from 1.8%-54.6%.[2]

The crude rate of TB notifications in the indigenous population was 6.5 per 100,000 population which is a decrease compared to the rates reported in 2009 (7.2) and in 2008 (7.4). The crude rate in foreign-born cases was 22.3 which was also a decrease compared to the rates reported in 2009 (26.9) and in 2008 (33.0).

The highest age-specific rates (per 100,000) in 2010 occurred among those aged 65 years and older (14.8) followed by those aged 25-34 years (13.9).

Rates among males were higher than females for all age groups except for those aged 15-24 years. In 2010, the highest rate in females was in those aged 15-24 years (13.1) and the highest rate among males was in those aged 65 years and over (21.0). The male to female ratio (1.6:1) reported in 2010 was consistent with the rate reported in 2009 (1.7:1). Males are predominant among TB cases in nearly all European countries with an overall M:F ratio of 1.8:1 in 2010.[2]

There was a notable difference in age between Irish 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 49 years. In foreign-born cases, the peak occurred in those aged 15-34 years with a median age of 30 years. The majority of foreign-born cases were from Asia (51.5%) and Africa (28.7%).

There were nine cases of TB meningitis reported in 2010 corresponding to a crude rate of 2.0 per million population, all were adults. Between 1998 and 2010, 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 10 million general population over the previous five years. Between 2006 and 2010, 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 (64.3%) and 35.7% had exclusively extrapulmonary TB. Of the pulmonary cases, 41.1% were sputum smear positive and the sputum smear-positive rate for 2010 was 2.4 per 100,000 population. Sputum microscopy results were available for 174 (64.4%) of the 270 cases. This is a decrease compared to 2009 (75.2%) and is the lowest recorded since 2002 (range 71.3-83.7%).

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 270 cases with a pulmonary component 76.3% were culture confirmed which remains stable in comparison to 77.4% in 2009. The proportion of new pulmonary cases that were culture confirmed was 77.4% a decrease from 80.1% in 2009. This falls just short of 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 35.8% (Hungary) to 100.0% (Greece).[2]

During 2010, 14% (59 cases) of all TB cases reported to HPSC were either culture unknown (10 cases) or culture not done (49 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 number of *M. bovis* detections among culture confirmed cases remained slightly elevated in 2010, with 12 cases (4.3% of culture confirmed cases) notified. This compares to eight cases (2.3%) notified during 2009 and 12 (3.8%) during 2008. Between 2002 and 2010, *M. bovis* detections accounted for 2.4% of all culture confirmed cases, with a mean of seven *M. bovis* cases notified annually. During 2010, 165 *M. bovis* cases were reported to ECDC by EU countries, corresponding to a notification rate of 0.03 per 100, 000 population, which was lower than the Irish notification rate of 0.26 per 100, 000 population.

The proportion of new culture confirmed pulmonary cases with reported drug sensitivity testing (DST) results increased from 94.7% in 2009 to 98.8% in 2010. This is now only slightly below the EU monitoring framework action plan target of 100% of new culture confirmed pulmonary cases with DST results.[10] 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 all previously treated cases irrespective of culture status.[9] Although Ireland did not meet this target in 2010, 100% of culture positive cases that were previously treated for TB had DST results.

Of the 26 resistant cases reported during 2010, two cases had MDR-TB which remains stable in comparison with recent years with one reported in 2009 and two in 2008. MDR-TB cases and cases resistant to isoniazid represented 0.5% and 3.3% of total cases respectively. This compares to 0.2% and 3.8% respectively in 2009. In 2010 the proportion of new cases with MDR-TB ranged from 0.0-18.3% 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. No case of XDR-TB was reported in Ireland in 2010.

The rate of resistance was higher in foreign-born cases than in Irish-born cases. The rate of resistance in foreign-born cases has steadily increased between 2006 and 2010, while the rate of resistance in Irish-born cases has declined during the same period. The majority of resistant cases in Ireland had no previous history of TB disease reported.

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 the prevention of 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. In 2010, information on treatment outcome was provided for 88.1% of cases notified, which is an increase on the proportion reported in 2009 (82.3%) and is similar to that reported in 2008 (88.4%). It is important to sustain and improve on the provision of this level of treatment outcome data.
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 (72.4%) increased during 2010 compared to 2009 (64.6%) and is comparable with those

reported for 2008 (73.8%). However, 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 treatment completed was 72.6%, which was an increase compared to 2009 (67.7%) but 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 case treated in the 2009 cohort was 100%. 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 81.0% of all cases during 2010. 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 61.8% in 2010. 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 they provide information to guide policy for targeting interventions in relation to TB disease and latent TB infection in the relevant groups.

The proportion of TB cases where HIV status was reported remains notably low at 23.3% of cases during 2010, a decline from the proportion reported in 2009 (28.4%). 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.[8,10] 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, particularly as HIV became notifiable in 2012.

This is the second year that reports on TB outbreaks have been included in this report. Outbreak reporting assists in the assessment of the burden of TB disease and latent TB infection and also will assists 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 yet achieved the ECDC targets. This highlights the

need to adopt a focused approach to reduce TB transmission in order to reach the "***The Stop TB Partnership"*** 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.

The importance of good surveillance data cannot be underestimated as they will help guide where resources should be directed e.g. identification of risk groups, areas with high TB notification rates 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 2011, Provisional Data (as of 25th October 2012)

There were 424 cases of TB provisionally notified in 2011. 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, 2011

Parameter	2011 (% of total)
Total number of cases	424
Crude notification rate per 100,000	9.2
Cases in indigenous population††††	188 (44.3%)
Cases in foreign-born persons	180 (42.5%)
Culture positive cases	287 (67.7%)
Pulmonary cases‡‡‡‡	292 (68.9%)
Of which sputum smear positive	122 (41.8%)
Resistant cases	24 (5.7%)
Multidrug-resistant cases	3 (0.7%)
TB meningitis cases	3 (0.7%)

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, 2011

HSE Area	Number of cases	Crude rate per 100,000	95% CI for rate
HSE E	193	12.9	11.1 - 14.7
HSE M	20	7.9	4.5 - 11.4
HSE MW	24	6.6	4.0 - 9.3
HSE NE	25	6.3	3.9 - 8.8
HSE NW	14	5.9	2.8 – 9.0
HSE SE	30	6.5	4.2 - 8.8
HSE S	87	14.0	11.1 - 16.9
HSE W	31	7.5	4.8 - 10.1
Ireland	**424**	**10.0**	**9.0 – 11.0**

†††† Country of birth unknown for 56 cases (13.2%)

‡‡‡‡ Includes the cases categorised as pulmonary +extrapulmonary (P+E)

Age and Gender
There were 181 cases (42.7%) of TB notified in females and 243 cases (57.3%) in males, giving a male to female ratio of 1.3:1. The mean age of cases notified was 42.7 years (range 1 to 91 years).

Geographic origin
Of the 424 cases provisionally notified in 2011, 188 (44.3%) were born in Ireland and 180 (42.5%) were foreign-born. Information on country of birth was not reported for 56 cases (13.2%).

Site of disease
Pulmonary TB was diagnosed in 262 cases (61.8%), extrapulmonary TB in 121 cases (28.5%) and pulmonary and extrapulmonary TB in 30 cases (7.1%). The site of disease was unknown for eleven cases (2.6%).

Of the 292 cases with a pulmonary disease component, 220 (75.3%) were culture positive and 122 (41.8%) were smear positive.

TB meningitis
There were three cases of TB meningitis provisionally notified in 2011 giving an incidence rate of 0.07 per 100,000 population (0.65 per million population). One was in the 35-44 year age group, one was in the 55-64 year age group and one was aged 65 years and over. BCG vaccination status was unknown for all three meningitis cases.

One case was culture positive, one case was culture negative and culture status was unknown for the remaining TB meningitis case.

Culture
Of the 424 cases provisionally notified in 2011, 287 (67.7%) were culture confirmed.

Species
Among the 287 culture positive cases, 269 (93.7%) were *M. tuberculosis* and six (2.1%) were *M. bovis*. The remaining 12 cases (4.2%) were reported as *M. tuberculosis* complex without further speciation.

Antibiotic resistance
Resistance was reported in 24 of the 287 culture positive cases (8.4%), including three cases (0.7% of total cases, 1.0% of culture positive cases) of MDR-TB. Mono-resistance to isoniazid was reported in 10 cases, to pyrazinamide in one case, and to streptomycin in five cases. Four cases were resistant to isoniazid and streptomycin and one case was resistant to isoniazid plus ethambutol.
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Appendix 2: Completeness of data, 2010

Completeness of data reported for 2010 notifications ranged from 100.0% (age, sex and diagnostic type) to 23.3% (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 2010.

Table A3: Completeness of reported data by variable

Variable	% Complete
Age	100.0
Sex	100.0
Diagnostic type	100.0
Country of birth (all notifications)	99.3
Country of birth (for foreign-born cases)	99.3
Sputum smear result (pulmonary cases)	91.9
Culture result	97.6
Isolate (Culture positive cases)	99.8
Isoniazid sensitivity result (Culture positive cases)	99.0
Rifampicin sensitivity result (Culture positive cases)	99.0
Case finding method	95.0
Treatment outcome	88.1
Previous history of TB (all cases)	85.7
Previous year of TB diagnosis (previously diagnosed cases)	78.8
Previous TB treatment history (previously diagnosed cases)	72.7
Previous TB treatment outcome (previously treated cases)	55.6
Risk group	81.0
HIV status	23.3

Appendix 3: Social Class (Source: CSO 2011)

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 2010 report is the thirteenth 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 2010, the national rate for sputum smear positive pulmonary TB was 2.4 per 100,000 population while in 2009 and 2008 the rates were 3.3 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 (2006-2010), the average annual notification rate of TB meningitis in children aged less than five years was 1.42 per 10 million general population. Between 2006 and 2010, 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 2010 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 2009, 2008, 2007 and 2006, the age-specific incidence rate for children aged 0-14 years was 1.8, 1.7, 4.7 and 2.4 per 100,000 population respectively.

Index of Tables and Figures

Tables

Figures:

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