Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Health Protection Surveillance Centre

Report on the Epidemiology of Tuberculosis in Ireland 2012

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

hpsc

Epidemiology of Tuberculosis in Ireland 2012

A Report by the
Health Protection Surveillance Centre

March 2015

Table of Contents

Acknowledgements

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

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

Summary of 2012 TB notifications

- TB case notifications decreased in 2012 (n=359, rate 7.8/100,000) compared to 2011 (n=413, rate 9.0/100,000). This is the lowest crude notification rate recorded since TB enhanced surveillance began in 1998.

- Regional variation was noted in TB notification rates (per 100,000 population) ranging from 5.0 in HSE South East to 10.2 in HSE South

- The highest rates were reported by Dublin North West, Dublin North Central and Dublin South City in HSE East

- The highest age-specific rate occurred among those aged 25-34 years old (10.5/100,000)

- The age-specific rate (per 100,000) among 0-14 years olds decreased from 1.9/100,000 in 2011 to 1.0/100,000 in 2012 while the rate in the 55-64 year olds increased from 7.6/100,0000 in 2011 to 9.3/100,000 in 2012

- Rates were higher in males for all age groups except for the 15-24 year age group. The highest rates among males were in the 55-64 year age group and among females in those aged 25-34 years.

- In 2012, 44.6% of cases were born outside Ireland compared to 46.7% in 2011 and 40.7% in 2010

- There was a notable difference in age between cases born in Ireland (median age 51 years) and foreign born cases (median age 33 years)

- Pulmonary cases accounted for 71.0% (255) of total TB cases, of which 85.1% (217) were culture positive and 46.3% (118) were smear positive

- There were three cases of TB meningitis notified, all in adults

- Treatment outcome data were provided for 77.7% of cases. Treatment was reported as completed for 60.7% of total cases and for 61.9% of sputum smear positive cases notified.

- There were 17 deaths reported (4 attributable to TB)

- There were 22 drug-resistant cases notified, including five MDR-TB cases. There were no cases of XDR-TB reported in 2012.

- There were 381 cases of TB provisionally notified in 2013 which is an increase of 6% compared to 2012

Introduction

In 2012, 6.1 million cases of TB were notified by national TB control programmes and reported to the World Health Organization (WHO) (84.7 per 100,000 population). Of these, 2.5 million were new pulmonary sputum smear positive cases. Approximately 1.3 million TB deaths occurred globally in 2012.[1]

In 2012, 361,167 cases of TB were reported by 50 of the 53 countries of the WHO European Region. The overall notification rate averaged at 40 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 2012 in the WHO European region.

The lowest rate in the region occurred in Western Europe (EU countries plus Iceland and Norway) at 13.5 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 (85.2), Lithuania (59.2), Latvia (48.6), Bulgaria (31.1), Portugal (25.2) and Estonia (21.6).

In 2012, 26.8% of reported TB cases in Western Europe were foreign born. This proportion ranged from 0.2% to 85.4% across 29 countries. Multidrug-resistance (MDR) remained most frequent in the Baltic States (13.8-25.5%) followed by Romania (8.9%). Other countries reported lower levels of multidrug-resistant TB (MDR-TB) ranging from 0.0-6.9%.

In 2012, 293,360 notifications were reported from 20 of the 24 non-EU European and central Asian countries of which 51.1% were from the Russian Federation. The highest rates per 100,000 population in this region were reported by Moldova (152.2), Kazakhstan (132.3) and Kyrgyzstan (126.3) while the lowest rate was reported by Switzerland (5.8). The highest burden of MDR-TB cases in the European region is in this area where the prevalence is 18.3% in newly diagnosed cases, almost seven times higher than the prevalence reported in the EU/EEA countries (4.0%).

Overall, the proportion of cases with MDR-TB across the entire European region was 23.9% an increase compared to 2011 (19.0%). The proportion of total cases with MDR-TB was higher in the non-EU countries of Europe (29.4%) compared to the proportion in Western Europe (4.6%).

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 2012. Data for 2012 have been validated and updated to include information relating to treatment outcome. Provisional data for 2013 are presented in Appendix 1.

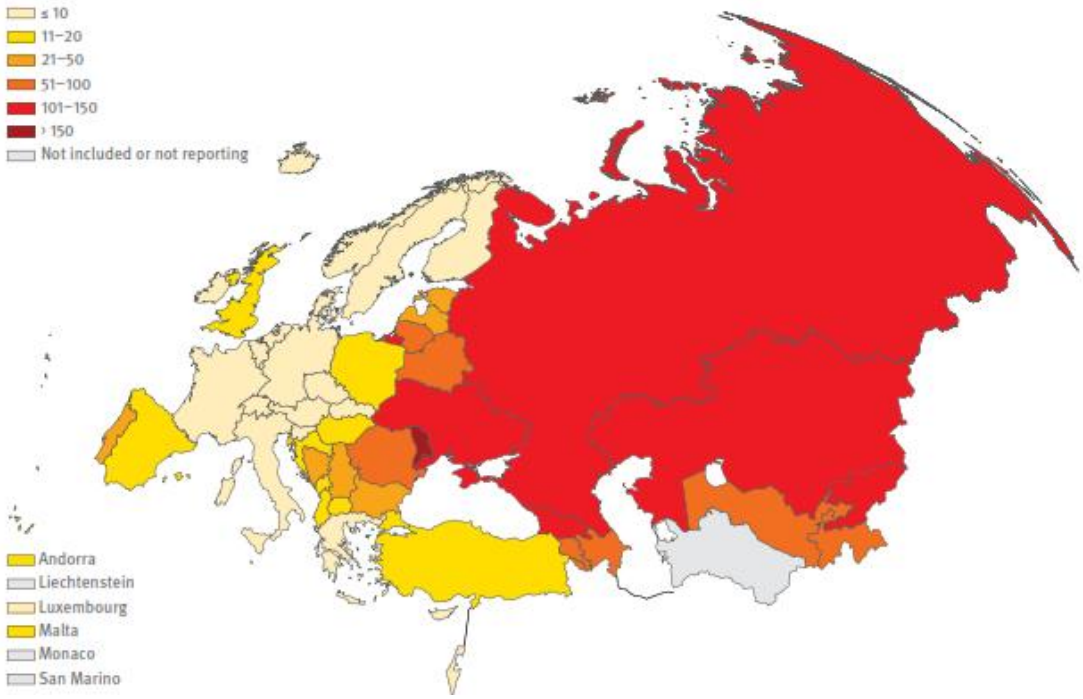

Figure 1: Tuberculosis notification rates per 100,000 population, WHO European region, 2012[2]

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 2012 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 2012 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).
- 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

---

* 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 Irish case definition, see http://www.hpsc.ie/hpsc/NotifiableDiseases/CaseDefinitions/

Methods

Data collection

An enhanced TB notification form was completed by public health doctors for each case of TB notified in 2012. 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 the Computerised Infectious Disease Reporting (CIDR) system. Finalised 2012 data (with outcome information) and provisional 2013 data were extracted from CIDR during August 2014.

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.

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. Data for 2012 and provisional 2013 data were taken from the Computerised Infectious Disease Reporting (CIDR) system.

Rates for 1991 to 1993 are based on the 1991 population census; rates for 1994, to 1999 are based on the 1996 population census; rates for 2000 to 2003 are based on the 2002 population census; rates for 2004 to 2008 are based on the 2006 population census and rates for 2009 to 2013 are based on the 2011 census.

For the calculation of rates in the Irish-born and foreign-born population, denominator data represent persons usually resident in each province and county, and present in the state on census night. The Irish-born 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 2012 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. 2012 LHO rates were calculated using Census 2011 LHO denominator data extracted from Health Atlas[8] 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 CIDR were analysed for completeness. Appendix 2 shows the completeness of reporting for these variables during 2012.

Results: TB cases in Ireland, 2012

Overall cases and rates

There were 359 cases of TB notified in 2012, a rate of 7.8 per 100,000 population. A summary of the 2012 data is shown in table 1.

Table 1: Summary of the epidemiology of TB in Ireland, 2012

Parameter	Number (Rate/100,000)	% of Total
Total cases	359 (7.8)	-
Cases in Irish-born population[§]	196 (5.2)	54.6
Cases in foreign-born persons[*]	160 (20.9)	44.6
Culture positive cases	284	79.1
Pulmonary cases	255	71.0
Smear positive pulmonary cases	118	32.9
Multidrug-resistant cases	5	1.4
Mono-resistant to isoniazid	10	2.8
Deaths attributable to TB	4	1.1
Outcomes reported in cases	279	77.7
TB meningitis cases	3	0.8

[§] Country of birth was unknown for 3 (0.8%) cases

The number and rates of TB cases notified for each of the years from 1991-2012 are shown in table 2. Three-year moving averages for the years 1992-2011 are also shown.

Table 2: Number and rates of notified cases of TB in Ireland, 1991-2012 with 3-year moving averages, 1992-2011

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	433
2011	413	9.0	401
2012	359	7.8	

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 (10.2/100,000) while the lowest rate was reported in HSE South East (5.0/100,000).

The crude incidence rates seen in each HSE area from 1992 to 2012 are shown in table 4 while the 3-year moving average TB notification rates for each HSE area from 1992 to 2011 are shown in table 5.

Table 3: Notified TB cases by HSE area, 2012

HSE area	Number of cases	Crude rate per 100,000	95% CI for rate
HSE E	148	9.1	7.7 - 10.6
HSE M	27	9.6	6.0 - 13.2
HSE MW	21	5.5	3.2 - 7.9
HSE NE	24	5.4	3.3 - 7.6
HSE NW	14	5.4	2.6 - 8.3
HSE SE	25	5.0	3.1 – 7.0
HSE S	68	10.2	7.8 - 12.7
HSE W	32	7.2	4.7 - 9.7
Ireland	**359**	**7.8**	**7.0 - 8.6**

Table 4: Crude TB incidence rates per 100,000 population by HSE area, 1992-2012

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**
2011	11.6	6.4	6.3	5.7	5.0	6.0	12.6	7.0	**9.0**
2012	9.1	9.6	5.5	5.4	5.4	5.0	10.2	7.2	**7.8**

Table 5: 3-year moving average TB notification rate 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	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**
2010	12.1	8.1	7.2	6.4	7.4	6.1	13.0	5.3	**9.4**
2011	10.9	7.7	6.5	5.9	5.7	5.6	12.3	6.5	**8.7**

Age and sex distribution

There were 141 (39.4%) cases of TB notified in females in 2012 and 217 (60.6%) in males, giving a male to female ratio of 1.5:1. Age was unknown in the remaining case. Table 6 gives the breakdown of notified TB cases by sex and HSE area.

Table 6: TB cases by HSE area and sex, 2012

HSE area	Female	Male	Male: Female ratio	Total
HSE E	62	85	1.4	**147**
HSE M	12	15	1.3	**27**
HSE MW	10	11	1.1	**21**
HSE NE	13	11	0.8	**24**
HSE NW	5	9	1.8	**14**
HSE SE	8	17	2.1	**25**
HSE S	23	45	2.0	**68**
HSE W	8	24	3.0	**32**
Total	**141**	**217**	1.5	**358**

In 2012, the median age of cases was 40 years (range: 0-90 years). The median age for Irish-born cases was 51 years and 33 years for foreign-born cases.

Table 7 shows the number of cases and the age-specific rates for males and females in 2012. The highest age-specific rates in 2012 occurred in the 25-34 year age group (10.5/100,000) and among those aged 65 years and older (10.3/100,000). The age-specific rate among 0-14 year olds decreased from 1.9/100,000 in 2011 to 1.0 in 2012.

Rates in males were higher in all age groups except in the 15-24 year age group (F 8.6 vs. M 7.6). The highest rate among females was in the 25-34 year age group (10.1) while the highest rate among males was in the 55-64 year age group (15.1). Figure 2 shows the age-specific rates of TB in Ireland from 2000 to 2012.

Table 7: TB cases and age-specific rates per 100,000 population for males and females, 2012

Age Group (years)	Female		Male**		Total	
	Cases	Rate	Cases	Rate	Cases	Rate
0-14	4	0.8	6	1.2	**10**	**1.0**
15-24	25	8.6	22	7.6	**47**	**8.1**
25-34	39	10.1	40	10.9	**79**	**10.5**
35-44	21	6.1	46	13.2	**67**	**9.6**
45-54	23	7.9	33	11.4	**56**	**9.7**
55-64	8	3.5	35	15.1	**43**	**9.3**
65+	21	7.2	34	14.0	**55**	**10.3**
Total	**141**	**6.1**	**216**	**9.5**	**357**	**7.8**

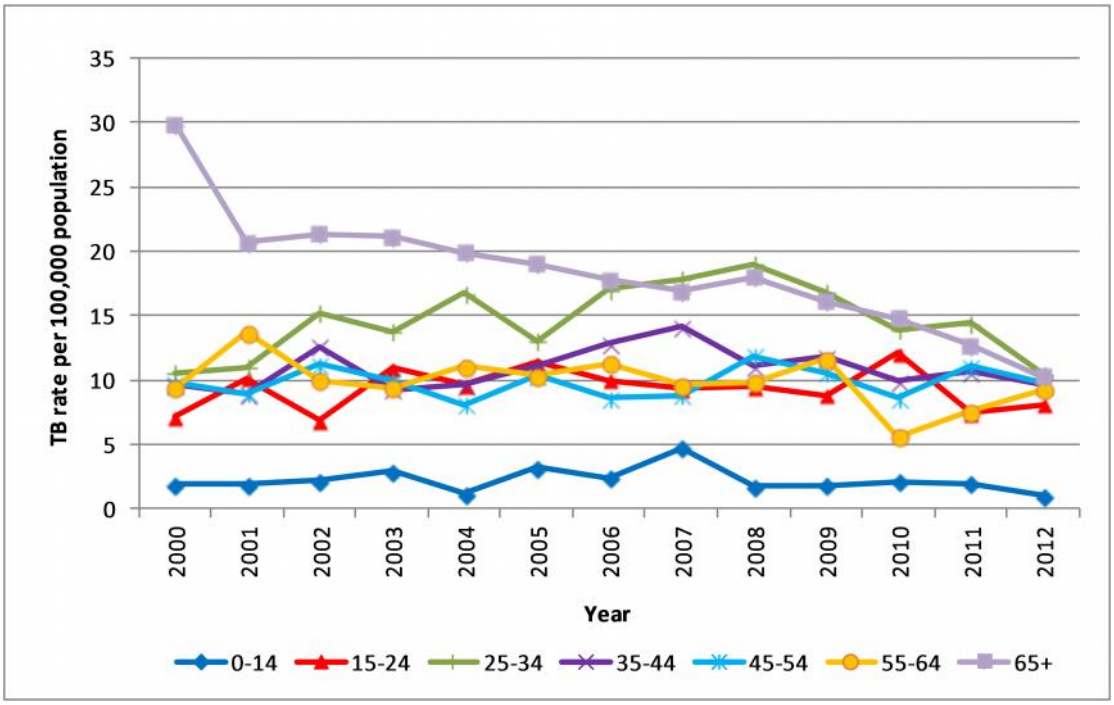

Figure 2: Age-specific rates of TB by year, 2000-2012

** Age was not reported for 1 male case and sex was not reported for 1 case in the 45-54 year age group.

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

Age-standardised TB incidence rates for each HSE area are presented in figure 3.

The highest age-standardised TB incidence rate (per 100,000 population) was seen in HSE South (10.1) while the lowest rate was reported by HSE South East (5.2).

Age-standardised incidence rates for each county for 2012 are shown in table 8 and figure 4 (95% confidence intervals are included in table 8). The highest rates (per 100,000 population) were reported from Cork (10.6), Laois (10.6) and Dublin (10.1). The lowest rates (per 100,000) were in Carlow (3.8), Wexford (3.6) and Roscommon (2.0). No cases were reported from Leitrim.

Crude incidence rates for each local health office (LHO)[††] in 2012 are shown in table 9. Three-year moving averages for the crude incidence rates are presented in table 10. In 2012, the highest crude rates (per 100,000 population) were in Dublin West LHO (16.4), Dublin North Central LHO (15.5) and Dublin South City LHO (13.8).

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

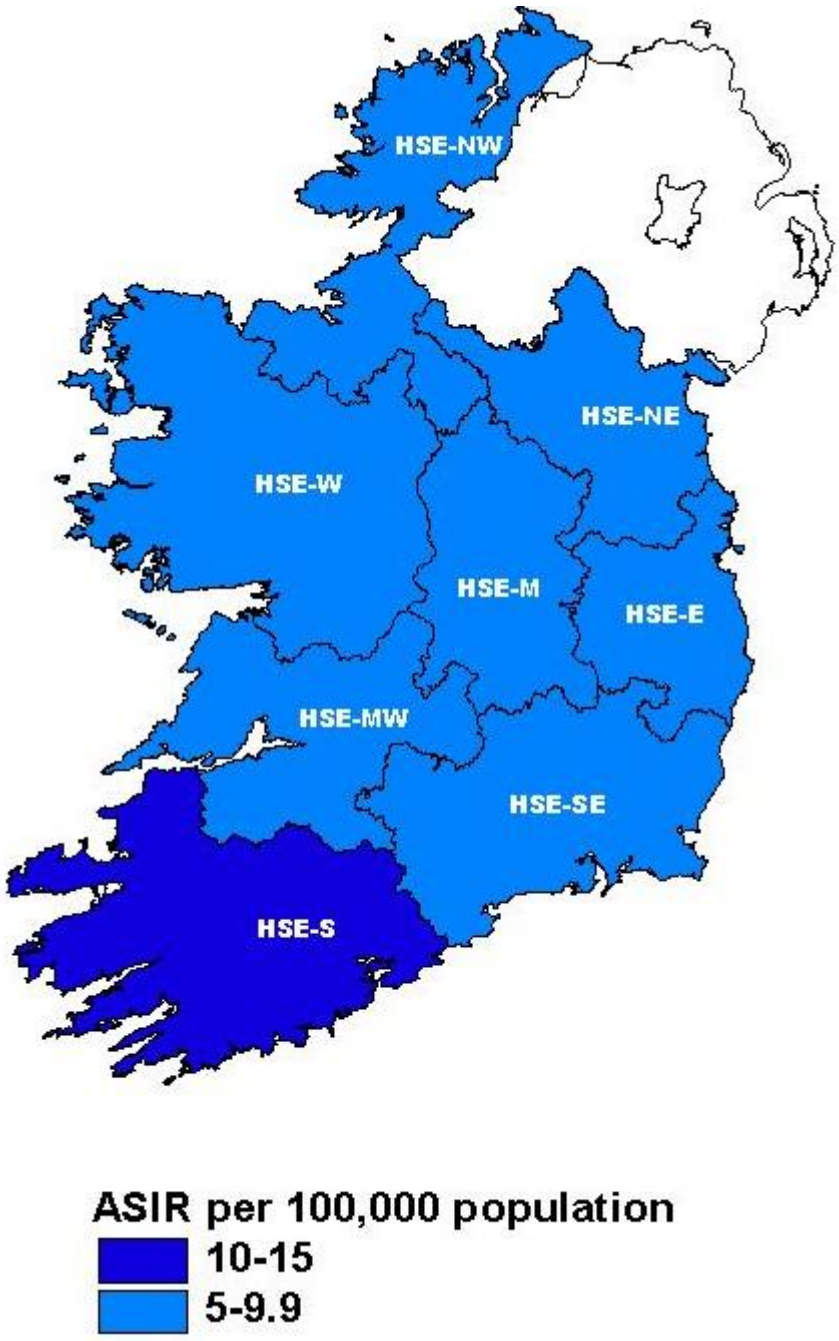

Figure 3: Age-standardised TB incidence rates per 100,000 population by HSE area, 2012

Table 8: Age-standardised TB incidence rates (per 100,000 population) by county with 95% confidence intervals, 2012

County	ASIR	95% CI
Dublin	10.1	8.3 - 11.8
Kildare	4.9	1.8 - 7.9
Wicklow	4.3	0.9 - 7.8
Laois	10.6	3.6 - 17.6
Longford	9.7	0.2 - 19.2
Offaly	7.9	1.6 - 14.3
Westmeath	9.6	2.9 - 16.3
Clare	4.9	1.0 - 8.9
Limerick	6.3	2.7 - 9.8
Tipperary North	4.4	-0.7 - 9.5
Cavan	5.7	0.1 - 11.4
Louth	6.5	2.0 - 11
Meath	5.1	1.7 - 8.5
Monaghan	4.6	-0.6 - 9.9
Donegal	5.8	2.0 - 9.6
Leitrim	0.0	0.0 – 0.0
Sligo	7.8	0.9 - 14.7
Carlow	3.8	-1.5 – 9.0
Kilkenny	7.4	1.9 – 13.0
Tipperary South	4.7	0.0 - 9.4
Waterford	6.5	1.7 - 11.4
Wexford	3.6	0.4 - 6.8
Cork	10.6	7.8 - 13.4
Kerry	8.6	3.8 - 13.4
Galway	8.5	4.9 - 12.1
Mayo	7.6	2.7 - 12.5
Roscommon	2.0	-1.9 - 5.9
Ireland	**7.8**	**6.9 - 8.7**

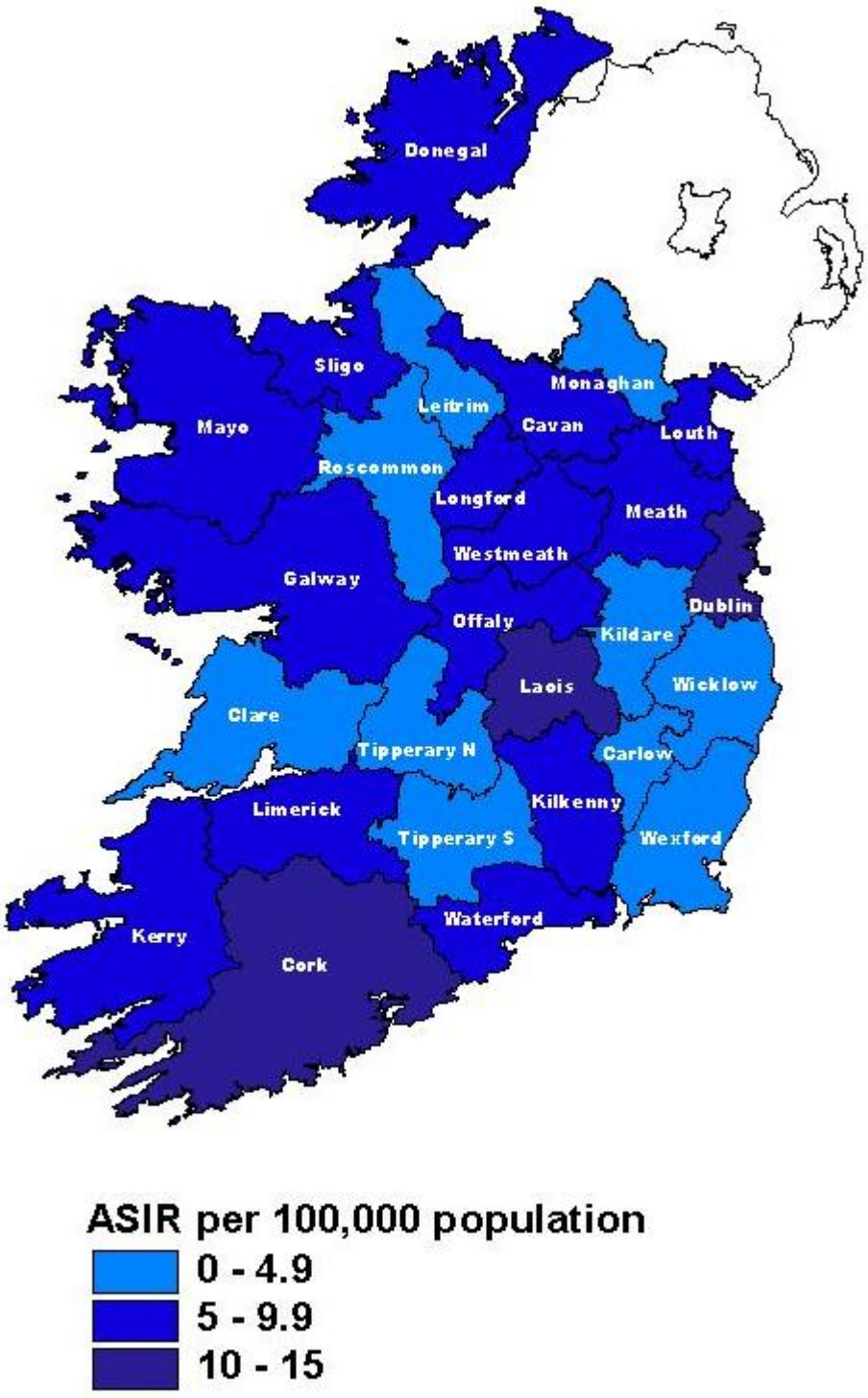

Figure 4: Age-standardised TB incidence rates per 100,000 population by county, 2012

Crude incidence rates by Local Health Office (LHO)

Table 9: TB Crude incidence rate per 100,000 population by LHO[‡‡], 2003-2012

HSE area	LHO	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
HSE-E	**Total**	**11.9**	**12.7**	**12.9**	**12.7**	**14.6**	**15.9**	**14.5**	**11.1**	**11.6**	**9.1**
	Dublin South	4.7	9.5	4.0	5.5	8.7	4.7	6.9	4.6	6.1	6.9
	Dublin South East	7.6	10.0	7.2	5.4	10.0	15.4	8.7	6.9	8.7	8.7
	Dublin South City	23.0	23.1	20.1	19.4	29.8	29.8	20.0	17.3	16.6	13.8
	Dublin South West	10.3	8.1	12.2	5.4	14.9	6.8	17.5	12.3	9.1	7.1
	Dublin West	19.1	20.1	18.7	17.9	16.4	28.4	17.8	14.4	28.0	10.9
	Dublin Nth West	17.4	12.9	19.4	21.0	24.7	21.5	25.3	16.4	14.9	16.4
	Dublin Nth Central	21.2	26.9	23.7	26.1	23.7	24.5	22.2	22.9	14.0	15.5
	Dublin Nth	4.9	11.7	9.9	11.7	8.6	9.5	11.5	9.0	8.6	4.9
	Kildare/W Wicklow	8.4	5.4	7.9	6.9	7.4	14.3	6.1	4.8	4.8	5.3
	Wicklow	5.0	2.7	5.5	7.3	2.7	5.5	9.3	3.4	8.4	3.4
HSE-M	**Total**	**5.3**	**3.6**	**6.4**	**6.0**	**6.4**	**9.5**	**8.9**	**8.5**	**6.4**	**9.6**
	LD/WH	7.8	4.4	8.8	5.3	6.2	14.1	8.8	15.2	5.6	9.6
	LS/OY	3.3	2.9	4.4	6.5	6.5	5.8	8.9	3.2	7.0	9.5
HSE-MW	**Total**	**12.1**	**12.2**	**14.7**	**10.2**	**8.3**	**6.9**	**7.1**	**7.6**	**6.3**	**5.5**
	Clare	6.8	10.8	19.8	8.1	7.2	3.6	6.8	8.5	6.8	5.1
	Limerick	na	11.9	13.2	14.5	9.3	11.2	8.3	7.8	6.8	6.3
	Tipp Nth/E Limerick	na	14.2	11.1	6.1	8.1	4.0	4.3	5.7	4.3	4.3
HSE-NE	**Total**	**7.5**	**5.8**	**3.3**	**8.4**	**6.1**	**4.6**	**6.1**	**6.8**	**5.7**	**5.4**
	Cavan/Monaghan	9.3	5.1	6.7	8.4	5.1	6.7	6.0	6.7	3.7	5.2
	Louth/Sth Monaghan	10.8	8.1	1.8	7.2	8.1	5.4	5.7	7.3	9.0	6.5
	Meath	3.7	4.9	1.8	9.2	5.5	2.5	6.5	6.5	4.9	4.9
HSE-NW	**Total**	**4.1**	**6.7**	**6.3**	**3.8**	**7.2**	**5.9**	**9.7**	**7.4**	**5.0**	**5.4**
	Donegal	2.9	6.8	4.1	2.7	6.8	4.8	8.1	5.6	7.4	5.6
	Sligo/Leitrim	5.9	6.6	9.9	5.5	7.7	7.7	12.3	10.3	1.0	5.1
HSE-SE	**Total**	**8.3**	**7.4**	**8.0**	**11.1**	**6.3**	**6.5**	**7.4**	**5.4**	**6.0**	**5.0**
	Carlow/Kilkenny	9.0	7.5	6.6	7.5	5.8	5.0	3.8	5.4	5.4	6.1
	Tipperary South	9.5	7.9	13.6	20.4	9.0	6.8	9.6	7.4	5.3	4.2
	Waterford	11.7	13.3	9.2	13.3	8.3	9.2	14.9	7.8	8.6	6.3
	Wexford	3.4	1.5	4.6	6.1	3.0	5.3	2.8	2.1	4.8	3.4
HSE-S	**Total**	**16.0**	**12.6**	**12.2**	**15.3**	**16.4**	**14.0**	**12.3**	**13.5**	**12.6**	**10.2**
	Kerry	12.1	10.0	6.4	6.4	6.4	7.2	5.5	4.8	7.6	8.9
	North Cork	10.9	12.4	6.2	8.7	7.4	8.7	13.4	19.0	14.5	10.1
	North Lee	22.4	14.9	21.5	28.0	19.7	22.1	13.8	16.5	16.0	12.7
	South Lee	19.7	11.2	11.7	16.2	30.1	15.6	16.2	18.8	15.2	11.0
	West Cork	2.0	7.5	9.3	5.6	0.0	9.3	10.6	0.0	3.5	3.5
HSE-W	**Total**	**6.0**	**10.4**	**10.9**	**7.7**	**10.6**	**7.5**	**4.7**	**4.7**	**7.0**	**7.2**
	Galway	5.3	9.5	11.2	8.2	13.4	7.8	6.4	6.0	7.6	8.4
	Mayo	8.5	7.3	9.7	7.3	4.8	6.5	2.3	3.1	4.6	7.7
	Roscommon	3.7	20.4	11.9	6.8	11.9	8.5	3.1	3.1	9.4	1.6
Ireland		**10.4**	**10.2**	**10.6**	**10.9**	**11.3**	**11.0**	**10.4**	**9.2**	**9.0**	**7.8**

[‡‡] 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[§§], 2002-2011

HSE area	LHO	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
HSE-E	**Total**	**11.9**	**12.0**	**12.6**	**12.8**	**13.2**	**14.5**	**15.2**	**14.0**	**12.1**	**10.9**
	Dublin South	4.1	5.9	6.9	5.7	5.9	6.9	6.3	5.8	5.6	5.9
	Dublin South East	7.6	8.4	8.7	7.5	7.0	10.2	12.3	9.9	7.8	8.2
	Dublin South City	23.0	22.6	22.3	20.7	22.1	27.2	27.3	21.8	17.8	16.1
	Dublin South West	8.4	9.1	9.7	9.5	9.5	10.5	11.5	13.5	12.8	9.4
	Dublin West	16.5	19.2	19.5	18.8	17.7	19.8	22.7	19.6	18.6	20.3
	Dublin Nth West	20.6	17.7	15.7	18.2	21.5	23.0	23.3	22.1	18.2	15.6
	Dublin Nth Central	21.6	22.0	24.7	25.1	24.9	24.5	23.7	22.9	20.5	16.6
	Dublin Nth	6.9	6.7	9.6	10.8	10.5	9.6	9.7	10.3	9.5	7.8
	Kildare/W Wicklow	7.3	7.5	6.8	7.0	7.3	9.0	10.5	7.8	5.1	4.9
	Wicklow	3.8	3.4	4.0	5.3	5.7	4.6	5.8	6.9	6.1	5.9
HSE-M	**Total**	**6.3**	**5.7**	**4.7**	**5.6**	**6.2**	**7.1**	**8.6**	**8.9**	**8.1**	**7.7**
	LD/WH	7.5	6.9	6.3	6.8	6.4	7.9	10.8	11.7	11.2	9.0
	LS/OY	5.3	4.6	3.4	4.5	6.0	6.3	6.8	6.7	5.6	6.7
HSE-	**Total**	**9.6**	**11.5**	**12.8**	**12.9**	**10.9**	**8.4**	**7.3**	**7.2**	**7.2**	**6.5**
	Clare	8.0	8.5	12.1	14.6	10.8	6.5	5.3	6.4	7.7	6.8
	Limerick	na	na	12.8	13.2	12.9	11.1	10.0	8.9	7.7	6.9
	Tipp Nth/E Limerick	na	na	13.5	10.6	7.8	6.6	5.1	4.6	5.0	4.6
HSE-NE	**Total**	**8.1**	**7.0**	**5.6**	**5.2**	**6.5**	**6.3**	**5.3**	**5.9**	**6.4**	**5.9**
	Cavan/Monaghan	8.8	7.3	6.5	6.7	7.2	6.3	6.1	6.4	5.8	4.9
	Louth/Sth Monaghan	11.0	10.4	7.2	4.7	6.1	7.2	6.1	6.0	7.3	7.9
	Meath	5.4	4.2	3.8	4.5	6.4	5.7	4.2	5.5	6.1	5.3
HSE-	**Total**	**5.2**	**5.1**	**6.0**	**5.8**	**5.3**	**6.0**	**7.2**	**8.2**	**7.4**	**5.7**
	Donegal	3.8	4.2	5.1	4.4	4.1	5.3	6.1	6.6	6.7	6.5
	Sligo/Leitrim	7.3	6.3	7.2	8.0	7.1	7.1	8.9	10.7	8.5	4.4
HSE-SE	**Total**	**9.0**	**8.9**	**7.8**	**8.6**	**9.1**	**7.5**	**6.7**	**6.7**	**6.1**	**5.6**
	Carlow/Kilkenny	9.7	9.1	7.6	7.0	6.8	6.0	4.9	4.5	5.0	5.6
	Tipperary South	5.3	7.9	9.7	13.9	15.8	11.3	8.0	8.3	7.4	5.6
	Waterford	16.4	15.0	11.9	11.2	11.0	9.8	10.4	11.7	9.8	7.8
	Wexford	4.1	3.6	2.8	4.2	4.9	4.4	4.1	3.2	2.9	3.8
HSE-S	**Total**	**13.7**	**14.5**	**13.4**	**13.1**	**14.8**	**15.5**	**14.2**	**13.1**	**13.0**	**12.3**
	Kerry	10.0	11.2	9.6	7.3	6.4	6.6	6.6	5.7	5.7	7.2
	North Cork	12.6	12.3	10.5	8.4	7.7	8.0	9.5	13.6	16.5	14.5
	North Lee	20.3	19.6	18.4	21.5	24.3	22.4	19.4	16.5	15.7	15.3
	South Lee	13.9	15.8	13.4	12.7	18.5	23.0	19.4	16.7	17.3	15.0
	West Cork	4.4	3.8	6.6	7.9	5.1	3.7	7.3	7.6	3.5	2.7
HSE-W	**Total**	**8.1**	**7.8**	**9.4**	**10.0**	**9.2**	**9.1**	**7.6**	**5.4**	**5.3**	**6.5**
	Galway	6.4	8.9	10.0	10.3	10.7	8.8	6.6	6.5	7.4	8.5
	Mayo	8.4	8.2	8.5	7.3	5.9	5.0	3.5	3.3	5.0	7.3
	Roscommon	11.6	14.1	12.8	9.4	9.8	8.0	4.5	4.7	5.9	3.1
Ireland		**10.3**	**10.4**	**10.3**	**10.6**	**10.9**	**11.2**	**11.0**	**10.3**	**9.4**	**8.7**

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

Geographic origin

Of the 359 patients diagnosed with TB in 2012, 196 (54.6%) were born in Ireland, 160 (44.6%) were born outside Ireland and for the remaining three cases (0.8%), the country of birth was unknown. The crude TB rate in the Irish-born population was 5.2 per 100,000 population while the crude rate in the foreign-born population was 20.9 per 100,000 population.

Figure 5 shows TB cases and rate per 100,000 population by geographic origin, compared to the national rate from 1998 to 2012.

Table 11 shows the breakdown of TB cases by HSE area and geographic origin for 2012.

Cases born outside Ireland originated from at least 41 countries. Table 12 shows the breakdown of these cases by country of birth and corresponding continent. Of the 160 cases born outside Ireland, 45.0% were born in Asia, 29.4% in Africa, 23.1% in Europe and 2.5% in America.

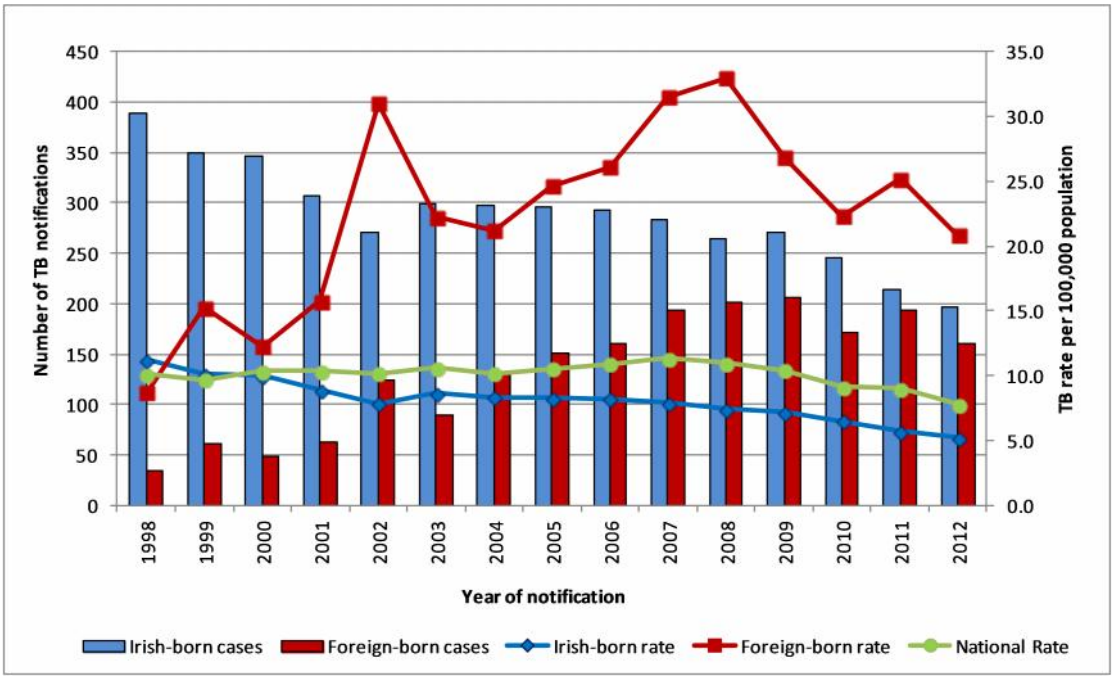

Figure 5: TB cases and rate per 100,000 by geographic origin, 1998-2012

Figure 6 illustrates the interval between arrival and notification for foreign-born TB cases with year of arrival reported between 2002 and 2012. The majority of TB notifications in the foreign born are notified within five years of arrival. Data completeness levels varied during this time period with a marked increase in data completeness from 2011 onwards (range: 0.0% in 2004 to 50.3% in 2011, mean: 22.4%).

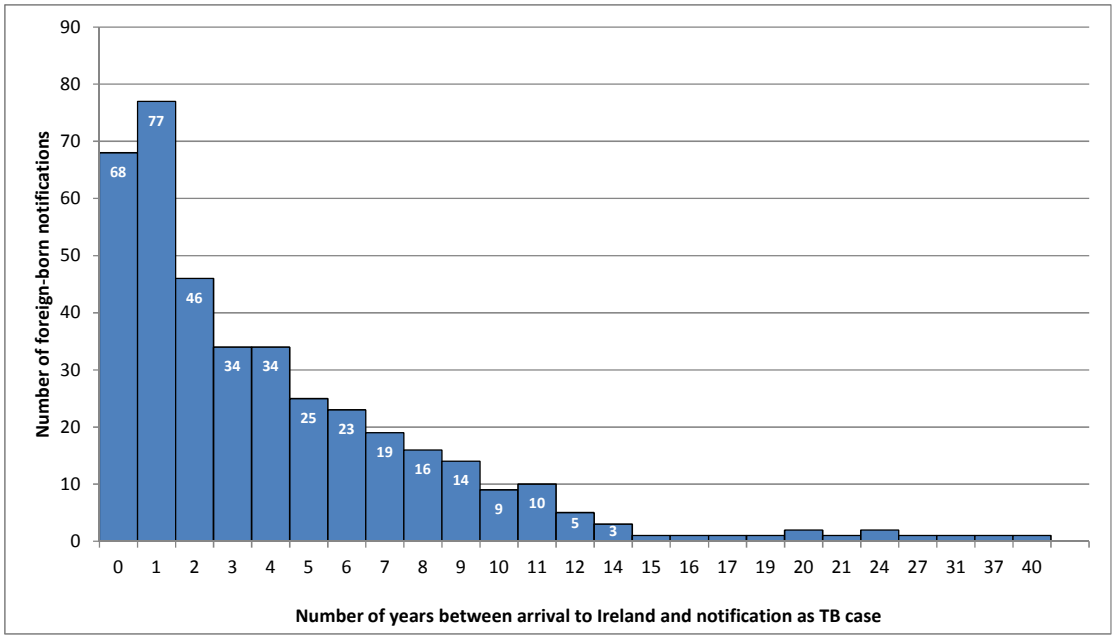

Figure 6: Interval between arrival & notification for foreign-born cases with year of arrival reported: 2002-2012

Table 11: TB cases and rates per 100,000 population by HSE area and geographic origin, 2012

HSE Area	Irish-born			Foreign-born			Unk	Total
	Cases	%	Rate	Cases	%	Rate		
HSE-E	59	*39.9*	***4.6***	87	*58.8*	***28.8***	2	**148**
HSE-M	16	*59.3*	***6.7***	11	*40.7*	***26.5***	0	**27**
HSE-MW	13	*61.9*	***4.1***	8	*38.1*	***15.1***	0	**21**
HSE-NE	13	*54.2*	***3.6***	11	*45.8*	***14.6***	0	**24**
HSE-NW	11	*78.6*	***5.4***	3	*21.4*	***5.9***	0	**14**
HSE-SE	15	*60.0*	***3.5***	10	*40.0*	***14.9***	0	**25**
HSE-S	51	*75.0*	***9.2***	17	*25.0*	***16.9***	0	**68**
HSE-W	18	*56.3*	***5.0***	13	*40.6*	***17.1***	1	**32**
Ireland	**196**	***54.6***	***5.2***	**160**	***44.6***	***20.9***	**3**	**359**

Table 12: Countries of origin of foreign-born patients with TB, 2012

Continent	Total	Country	Number of cases
Africa	**47**	Algeria	1
		Botswana	3
		Cameroon	2
		Congo	3
		Congo, Democratic Republic	3
		Guinea	1
		Malawi	5
		Mauritius	4
		Nigeria	10
		Somalia	7
		South Africa	5
		Uganda	1
		Zimbabwe	2
America	**4**	Brazil	2
		Costa Rica	1
		Peru	1
Asia	**72**	Afghanistan	1
		Bangladesh	1
		China	2
		Hong Kong	1
		India	23
		Mongolia	1
		Nepal	1
		Pakistan	21
		Philippines	15
		Saudi Arabia	1
		Sri Lanka	1
		Thailand	1
		Viet Nam	3
Europe	**37**	Czech Republic	1
		Estonia	1
		Latvia	4
		Lithuania	7
		Moldova, Republic of	2
		Netherlands	1
		Poland	4
		Romania	8
		Russian Federation	1
		Slovakia	1
		Turkey	1
		United Kingdom	6
Total			**160**

Figure 7 shows age-specific rates by geographic origin during 2012. The majority (76.1%) of cases born outside Ireland were aged between 15 and 44 years compared to 35.7% of Irish cases in this age range. The median age among foreign-born cases was 33 years (range: 9-81 years) compared to a median age of 51 years (range: 0-90 years) among Irish born cases.

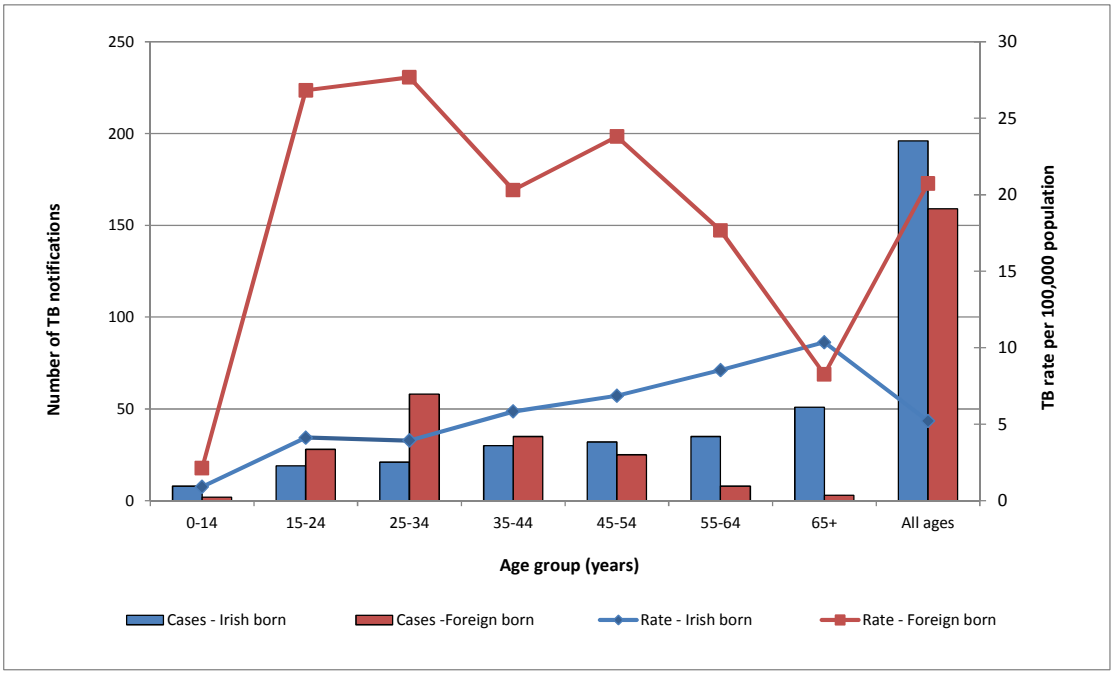

Figure 7: TB cases by age group (years) and age-specific rates by geographic origin, 2012

Site of disease

Of the 359 cases notified in 2012, 221 (61.6%) were pulmonary, 104 (29.0%) were extrapulmonary and 34 (9.5%) 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, 2012

HSE area	Pulmonary only		Extrapulmonary only		Pulmonary + Extrapulmonary		Total
	Cases	% of total	Cases	% of total	Cases	% of total	
HSE-E	82	*55.4*	61	*41.2*	5	*3.4*	**148**
HSE-M	19	*70.4*	5	*18.5*	3	*11.1*	**27**
HSE-MW	19	*90.5*	2	*9.5*	0	*0.0*	**21**
HSE-NE	15	*62.5*	5	*20.8*	4	*16.7*	**24**
HSE-NW	12	*85.7*	1	*7.1*	1	*7.1*	**14**
HSE-SE	12	*48.0*	8	*32.0*	5	*20.0*	**25**
HSE-S	40	*58.8*	16	*23.5*	12	*17.6*	**68**
HSE-W	22	*68.8*	6	*18.8*	4	*12.5*	**32**
Total	**221**	***61.6***	**104**	***29.0***	**34**	***9.5***	**359**

Pulmonary TB cases

The WHO defines pulmonary TB, for the purpose of analysis, as any case that has a pulmonary disease component. There were 255 cases reported in 2012 with a pulmonary disease component (71.0% of all cases reported). Sputum smear and culture results for these cases are shown in table 14. Sputum microscopy results were available for 165 (64.7%) of the 255 cases. This remains stable compared to 2011 (65.1) but remains low compared to previous years (mean: 73.8%).

Of the 255 pulmonary cases, 118 (46.3%) were sputum positive for AFB by microscopy and 217 (85.1%) were culture positive. This compares to 41.5% positive for AFB by microscopy and 74.0% culture positive in 2011. The proportion of pulmonary cases (with or without an extrapulmonary site) was higher in persons born in Ireland (81.6%) compared to those born abroad (55.6%).

Table 14: Sputum smear and culture status for pulmonary TB cases, 2012

Culture result	Sputum smear positive	Sputum smear negative	Sputum smear not done	Sputum smear unknown	Total
Culture positive	115	37	45	20	**217**
Culture negative	0	8	13	2	**23**
Culture not done	0	0	4	0	**4**
Culture not known	3	2	3	3	**11**
Total	**118**	**47**	**65**	**25**	**255**

Extra-pulmonary TB cases

One hundred and four cases (29.0%) had exclusively extrapulmonary TB of whom 67 (64.4%) were culture confirmed and 36 (34.6%) were histology positive.

One hundred and thirty-eight (38.4%) of all cases reported in 2012 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 pleural (25.4%). There were three cases (2.2% of extrapulmonary cases) of TB meningitis in 2012.

Table 15: Extrapulmonary disease sites in notified cases, 2012[***]

Site of disease	Number of cases	Percentage
Lymph (extra-thoracic)	37	26.8
Pleural	35	25.4
Peritoneal	13	9.4
Lymph (intra-thoracic)	12	8.7
Other	12	8.7
Spinal	9	6.5
Disseminated	7	5.1
Bone	4	2.9
Genitourinary	4	2.9
Meningeal	3	2.2
CNS	1	0.7
EP site not specified	1	0.7
Total	**138**	**100.0**

TB meningitis

There were three cases of TB meningitis reported in 2012 giving an incidence rate of 0.07 per 100,000 population (0.7 per million population). A profile of these cases is provided in table 16. Two cases were exclusively extrapulmonary and one was reported as culture confirmed. All three cases were in adults, two of whom were foreign-born. One case was unvaccinated while BCG status was not reported for the remaining two cases.

Table 16: TB meningitis cases in Ireland, 2012

HSE area	Age group (years)	Country of birth	Culture status	History of BCG
HSE-E	45-54	Foreign-born	Negative	Unknown
HSE-S	35-44	Foreign-born	Positive	Unknown
HSE-W	65+	Irish-born	Unknown	Unvaccinated

Between 1998 and 2012, a total of 91 cases of TB meningitis have been reported (figure 8). The cumulative incidence rates of TB meningitis in each HSE area and in Ireland for 1998-2012 are shown in table 17. The highest cumulative rate of TB meningitis between 1998 and 2012 is in HSE South (3.9 per 100,000).

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

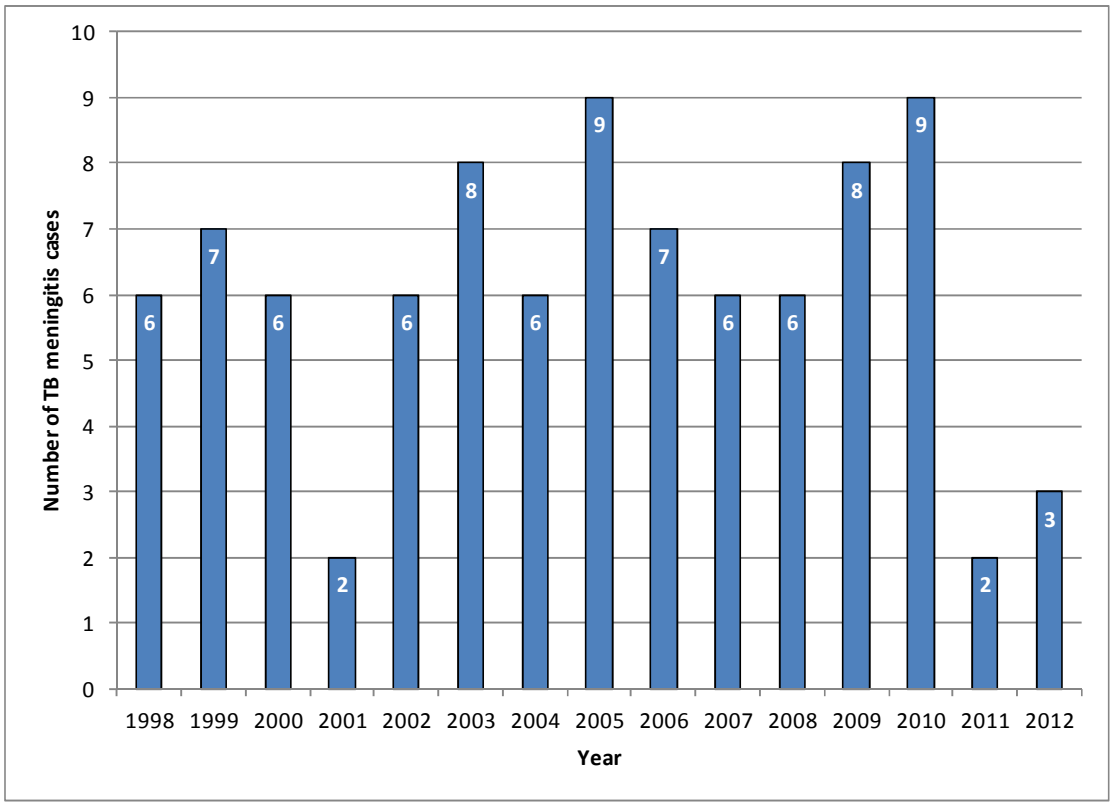

Figure 8: Number of TB meningitis cases, 1998-2012

Table 17: Cumulative incidence rate of TB meningitis in Ireland, 1998-2012

HSE area	Cases 1998 to 2012	Cumulative incidence rate (per 100,000)[†††]	95% CI
HSE-E	31	2.1	1.3 - 2.8
HSE-M	0	0.0	0 - 0
HSE-MW	8	2.2	0.7 - 3.8
HSE-NE	11	2.8	1.1 - 4.4
HSE-NW	4	1.7	0 - 3.3
HSE-SE	7	1.5	0.4 - 2.6
HSE-S	24	3.9	2.3 - 5.4
HSE-W	6	1.4	0.3 - 2.6
Ireland	**91**	**2.1**	**1.7 - 2.6**

The highest cumulative age specific rates of TB meningitis between 1998 and 2012 were reported in the 25-34 year age group (3.3/100,000) followed by those aged 65 years and older (3.0/100,000) while the lowest rates were reported in the 45-54 year age group (0.8/100,000) and the 5-9 year age group (1.0/100,000). Figure 9 shows the number of TB meningitis cases by age group and cumulative age specific rate between 1998 and 2012.

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

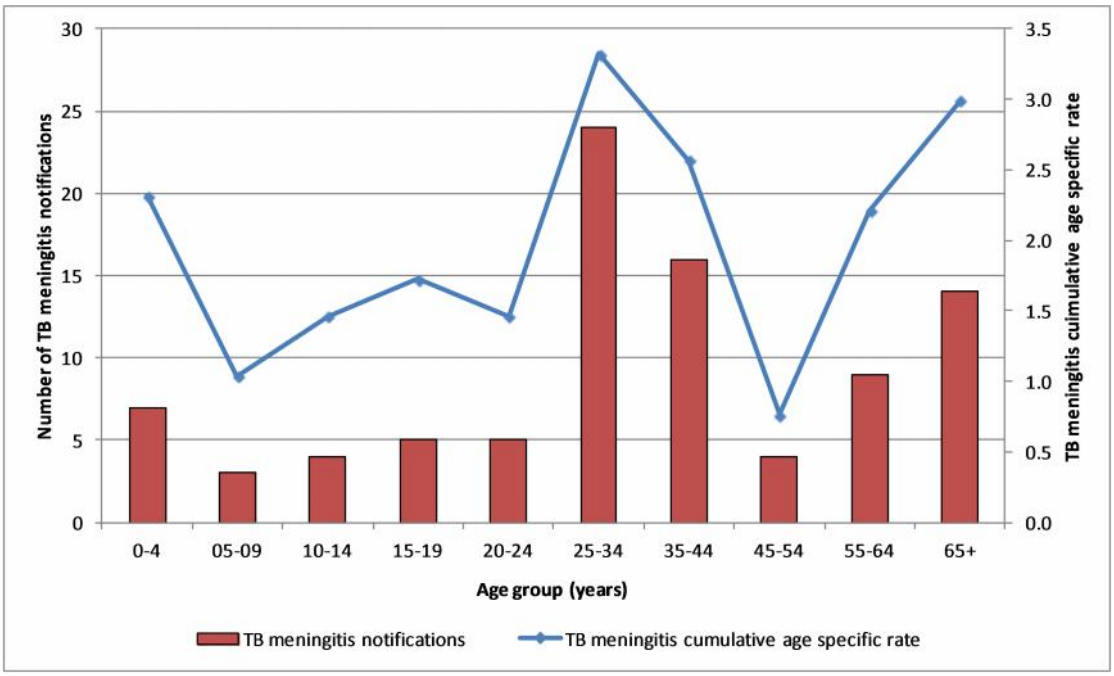

Figure 9: Cumulative number of TB meningitis notifications by age group and cumulative age specific rate, 1998-2012

Bacteriological results

Of the 359 cases notified in 2012, 310 (86.4%) were laboratory confirmed by culture, PCR, microscopy or histology.

Of the 255 cases with a pulmonary component, 227 (89.0%) were laboratory confirmed (by culture, microscopy or histology) and of the 104 cases with exclusively extrapulmonary disease, 83 (79.8%) were laboratory confirmed (by culture, PCR, microscopy or histology).

Culture

In 2012, 284 (79.1%) of all TB cases notified were culture positive. This is an increase in comparison to the percentage reported in 2011 (66.3%). Table 18 shows a breakdown by culture status and HSE area of TB cases notified in 2012 while figure 10 shows the number of TB notifications and percentage culture positive by year, 2002 to 2012.

Of the 255 cases with a pulmonary component, 217 (85.1%) were culture confirmed, an increase of 11% from 74.0 % reported in 2011. For new[‡‡‡] cases with a pulmonary component, 156 (86.7%) were culture confirmed, an increase of 8.5% compared to 78.2% reported in 2011.

Of the 104 cases with exclusive extrapulmonary disease, 67 (64.4%) were culture confirmed, which is an increase compared to 48.4% reported in 2011.

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

Table 18: Culture status of TB cases by HSE area, 2012

HSE area	Positive	Negative	Not done	Unknown	Total
HSE-E	115	7	7	19	**148**
HSE-M	22	4	1	0	**27**
HSE-MW	20	1	0	0	**21**
HSE-NE	20	1	0	3	**24**
HSE-NW	13	1	0	0	**14**
HSE-SE	22	3	0	0	**25**
HSE-S	50	13	5	0	**68**
HSE-W	22	8	1	1	**32**
Ireland	**284**	**38**	**14**	**23**	**359**

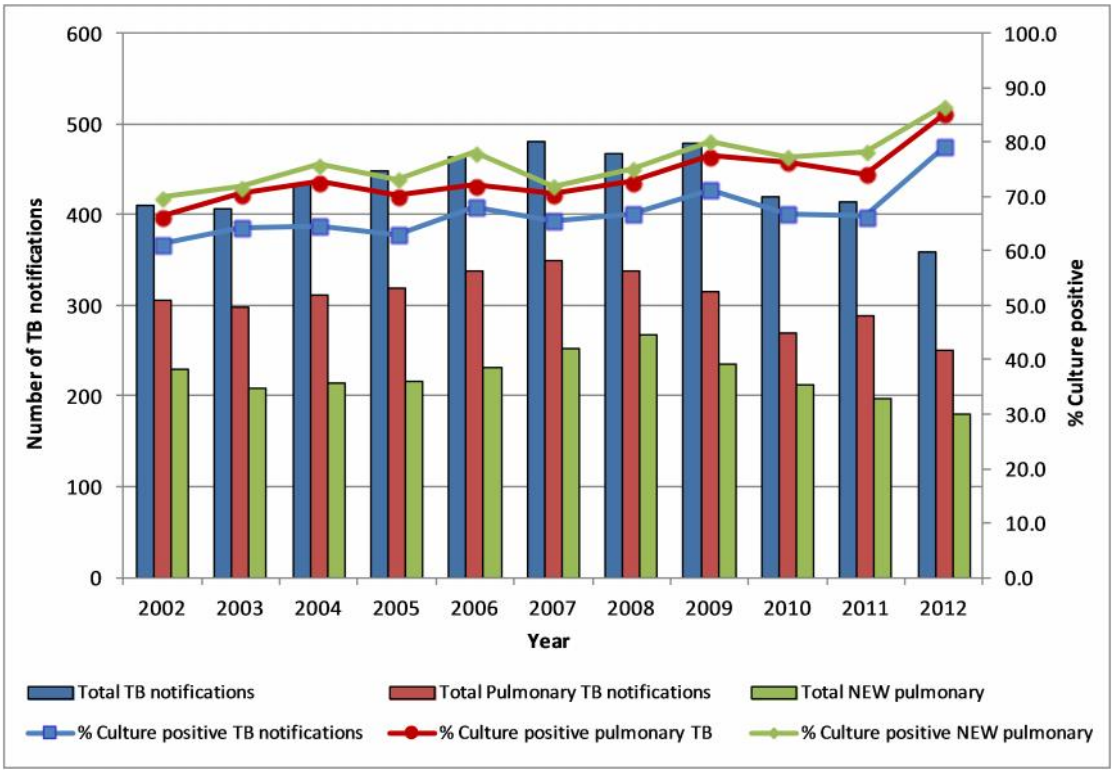

Figure 10: Number of TB notifications and percentage culture positive by year, 2002-2012

Species

Information on species was reported for 281 (98.9%) of the 284 culture confirmed cases. Of the cases where species was reported, 272 (96.8%) were *M. tuberculosis*, four (1.4%) were *M. bovis,* four (1.4%) were *M. africanum* and one (0.4%) was *M. canettii.* The remaining three culture positive isolates (1.1%) were reported as *M. tuberculosis* complex.

Of the four *M. bovis* cases notified during 2012, none had a previous history of TB reported and three were born in Ireland. Two cases were reported as having a risk factor for TB. One case reported receiving BCG vaccination. Cases were aged between 1-49 years. No resistance was reported in three cases with DST results, while the remaining case did not have DST results.

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 2002-2012

Year	*M. africanum*		*M. bovis*		*M. canettii*		*M. tuberculosis*		*M. tuberculosis* complex		Species unknown	
	N	%	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*
2011	0	*0.0*	6	*2.2*	0	*0.0*	254	*88.2*	14	*4.9*	-	-
2012	4	*1.4*	4	*1.4*	1	*0.4*	272	*94.8*	3	*1.0*	-	-
Total	**13**	***0.4***	**72**	***2.2***	**1**	*0.0*	**3053**	***95.0***	**17**	***0.5***	**40**	***1.3***

Anti-TB drug resistance[§§§]

Information on the results of drug sensitivity testing (DST) was reported for 278 (97.9%) of the 284 culture confirmed cases, an increase compared to the proportion reported in 2011 (91.2%). The proportion of culture confirmed cases with DST results reported was 97.4% 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 2002-2012

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
2011	91.2	94.2	93.3	87.5
2012	97.9	97.4	100.0	100.0
Mean	**95.0**	**96.2**	**94.0**	**94.1**

Of the 278 cases where sensitivity results were reported, resistance was documented in 22 cases (7.9%; 6.1% of total cases), including five cases of MDR-TB (1.8%; 1.4% of total cases). Mono-resistance to isoniazid was recorded in 10 cases, and to streptomycin in five cases. Two cases were resistant to isoniazid and streptomycin. Details of resistant cases are summarised in table 21.

Of the 22 drug resistant cases 15 (68.2%), including all five MDR-TB cases, were foreign born (figure 11). Fourteen of the 22 drug resistant cases had no previously recorded history of TB and previous TB history was unknown for the remaining eight drug resistant cases (figure 12). There were no XDR-TB cases reported in Ireland during 2012.

A summary of drug resistance in 2012 is shown in table 21 and the drug sensitivity results of the MDR-TB cases are shown in table 22 while figure 13 shows the number and percentage (of cases with DST results) of MDR-TB and XDR-TB notifications by year: 2000-2014.

[§§§] 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, 2012

DST results	Number of cases	% of culture confirmed cases
Cases with DST results	278	*97.9*
Resistant cases	22	*7.7*
MDR-TB	5	*1.8*
Mono-resistance to isoniazid	10	*3.5*
Mono-resistance to rifampicin	0	*0.0*
Mono-resistance to pyrazinamide	0	*0.0*
Mono-resistance to ethambutol	0	*0.0*
Mono-resistance to streptomycin	5	*1.8*
Cases resistant to isoniazid and streptomycin	2	*0.7*

Table 22: Sensitivity results of MDR-TB cases, 2012

Diagnosis	Isolate	Isoniazid	Rifampicin	Pyrazinamide	Ethambutol	Streptomycin
Pulmonary	M.TB	**R**	**R**	S	S	S
Pulmonary	M.TB	**R**	**R**	S	S	S
Extrapulmonary	M.TB	**R**	**R**	**R**	S	**R**
Pulmonary + extrapulmonary	M.TB	**R**	**R**	S	S	S
Pulmonary	M.TB	**R**	**R**	S	**R**	**R**

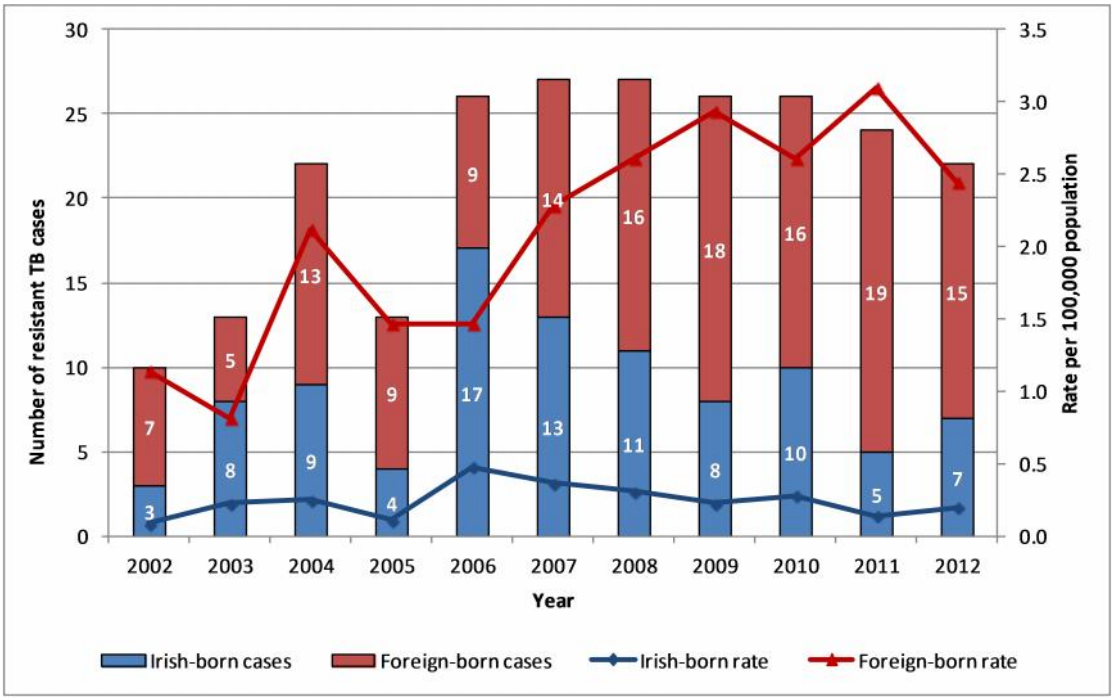

Figure 11: Number and rate of TB notifications with resistance to any first line anti-TB drug by geographic origin and year 2002-2012

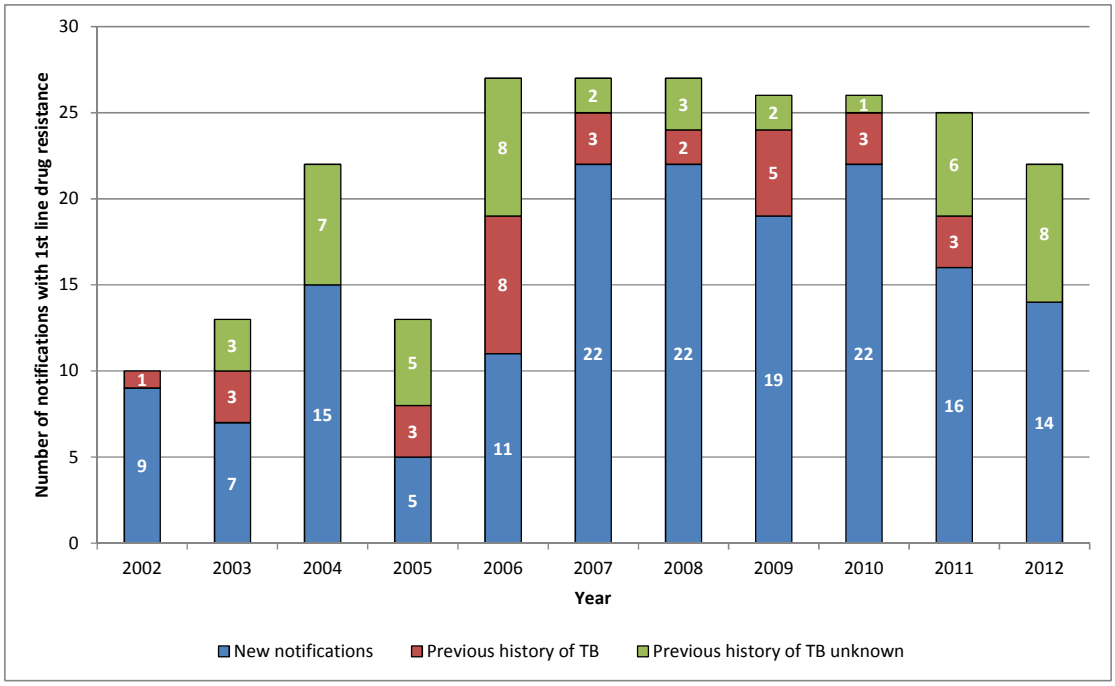

Figure 12: Number of TB notifications with resistance to any first line anti-TB drug by previous history of TB and year 2002-2012

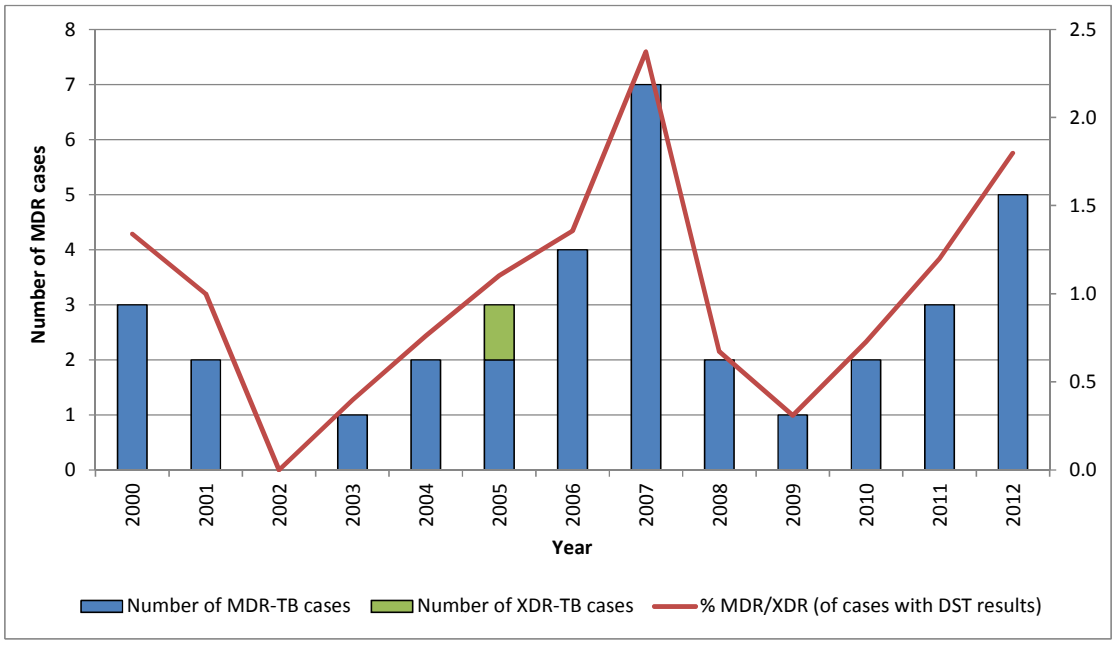

Figure 13: Number of MDR-TB and XDR-TB cases and percentage MDR/XDR-TB cases by year: 2000-2012

Case classification

Using the case definitions (described in the Methods section), TB cases notified in 2012 can be classified into confirmed, probable and possible cases as outlined in Table 23. Of the 359 cases notified, 285 (79.4%) were confirmed, 25 (7.0%) were probable and 49 (13.6%) were possible cases.

Table 23: Case classification of TB cases by site of disease, 2012

Site of disease	Confirmed		Probable		Possible		Total
	Cases	%	Cases	%	Cases	%	
Pulmonary	188	85.1	7	3.2	26	11.8	**221**
Pulmonary + Extrapulmonary	30	88.2	2	5.9	2	5.9	**34**
Extrapulmonary	67	64.4	16	15.4	21	20.2	**104**
Total	**285**	**79.4**	**25**	**7.0**	**49**	**13.6**	**359**

Treatment outcome

Outcome was recorded for 279 (77.7%) of the 359 cases notified in 2012, an increase compared to 75.1% in 2011 (figure 14). Of the 359 cases, 218 completed treatment, 17 died, 16 were recorded as being lost to follow up, seven cases were transferred, treatment was interrupted in four cases and 17 cases were still on treatment at the time of reporting. Of the 17 deaths reported, four (1.1% of total cases) were attributed to TB.

Outcome was reported for 96 (81.4%) of the 118 smear positive cases. Of the 96, 73 completed treatment, seven died, five were lost to follow up and two cases were transferred while nine cases were still on treatment at the time of reporting. Of the seven 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 22 drug-resistant cases, 7 (31.8%) completed treatment, two cases died and three cases were still on treatment at the time of reporting. Treatment outcome was not reported for the remaining 10 resistant cases

Of the three MDR-TB cases reported in 2011, two were reported as completed and one was lost to follow up. Treatment outcomes for the MDR-TB cases reported during 2012 are not yet available.

Figure 15 shows TB notifications by treatment success and year while figure 16 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, 2012

Treatment outcome	Total		Smear Positive	
	Number	%	Number	%
Completed - cured	160	44.6	67	56.8
Completed - failed	0	0.0	0	0.0
Completed - status unknown	58	16.2	6	5.1
Died (attributed to TB)	4	1.1	2	1.7
Died (cause unknown)	10	2.8	3	2.5
Died (not attributed to TB)	3	0.8	2	1.7
Lost to follow up	16	4.5	5	4.2
Still on treatment	17	4.7	9	7.6
Transferred	7	1.9	2	1.7
Treatment interrupted	4	1.1	0	0.0
Unknown	80	22.3	22	18.6
Total	**359**	**100.0**	**118**	**100.0**

Table 25: Treatment outcome by HSE area, 2012

		Outcome known	Outcome unknown	Lost to follow up	Total
HSE E	**Number**	97	45	6	**148**
	%	*65.5*	*30.4*	*4.1*	*100.0*
HSE M	**Number**	25	1	1	**27**
	%	*92.6*	*3.7*	*3.7*	*100.0*
HSE MW	**Number**	19	0	2	**21**
	%	*90.5*	*0.0*	*9.5*	*100.0*
HSE NE	**Number**	5	19	0	**24**
	%	*20.8*	*79.2*	*0.0*	*100.0*
HSE NW	**Number**	14	0	0	**14**
	%	*100.0*	*0.0*	*0.0*	*100.0*
HSE SE	**Number**	24	0	1	**25**
	%	*96.0*	*0.0*	*4.0*	*100.0*
HSE S	**Number**	59	5	4	**68**
	%	*86.8*	*7.4*	*5.9*	*100.0*
HSE W	**Number**	20	10	2	**32**
	%	*62.5*	*31.3*	*6.3*	*100.0*
National	**Number**	**263**	**80**	**16**	**359**
	%	***73.3***	***22.3***	***4.5***	***100.0***

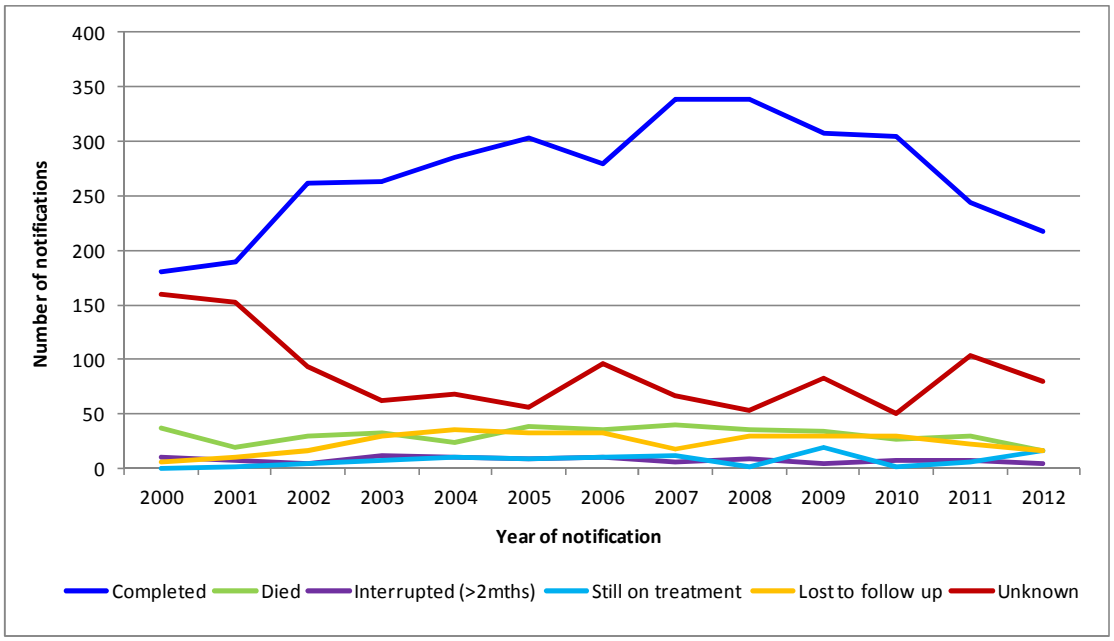

Figure 14: TB notifications by treatment outcome and year 2000-2012

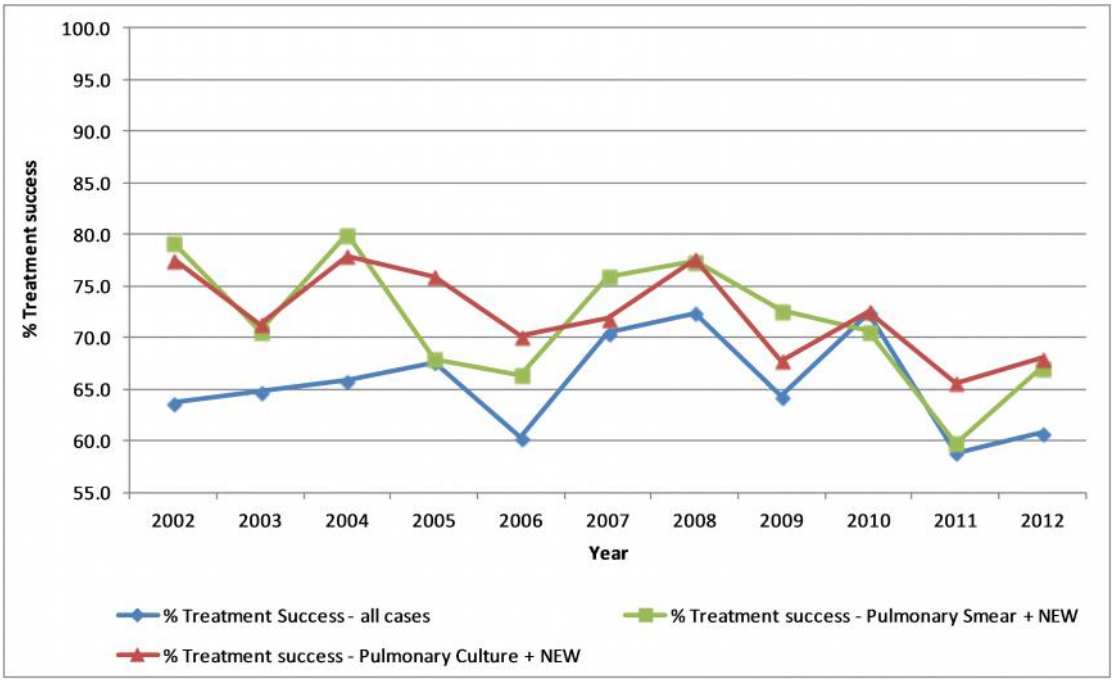

Figure 15: TB notifications by treatment success and year 2002-2012

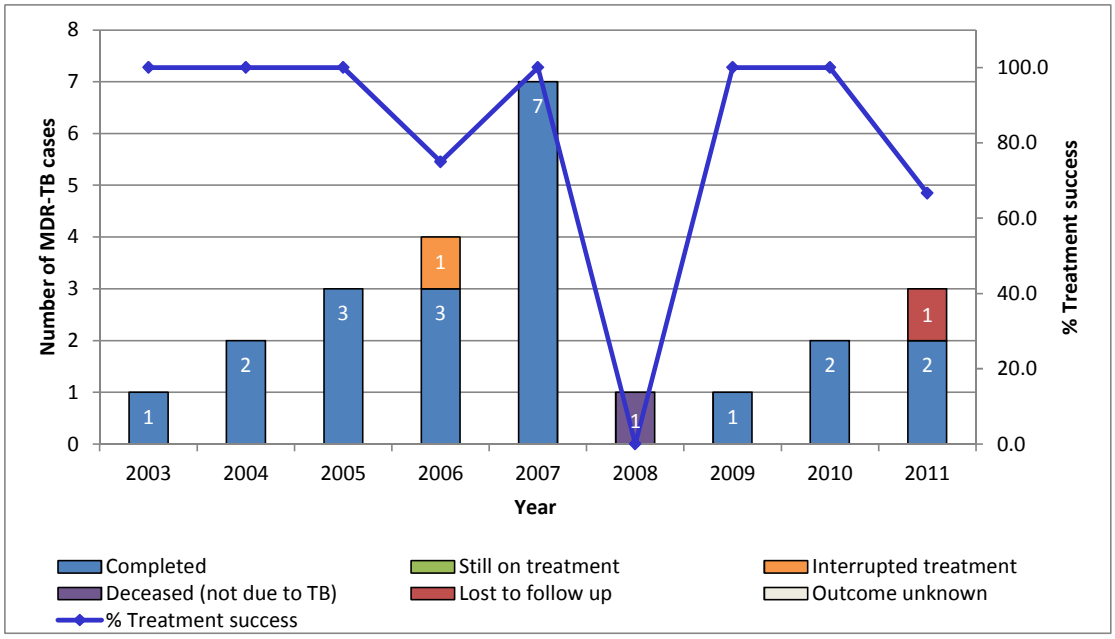

Figure 16: Number of MDR-TB notifications by treatment outcome and percentage treatment success by year, 2003-2011

Case ascertainment

Table 26 summarises the method by which cases notified in 2012 were found. The majority (87.2%) presented as a case with a further 6.1% found by contact tracing.

Table 26: Method of case finding, 2012

Case found by	Number of cases	Percentage
Presenting as case	313	87.2
Contact tracing	22	6.1
Post-mortem diagnosis	6	1.7
Immigrant screening	1	0.3
Other	9	2.5
Unknown	8	2.2
Total	**359**	**100.0**

Previous history of TB

Twenty-six (7.2%) of the 359 cases were reported to have a previous history of TB. The previous year of diagnosis was provided for 20 cases and ranged from 1950 to 2011 with 10 of the 20 cases (50.0%) reported to have had TB in the previous ten years.

Of the 26 cases with a previous history of TB, 12 reported having been treated for TB and three cases reported not being treated for TB (including one case where previous year of diagnosis was prior to the introduction of TB medication) and previous treatment was unknown for the remaining 11 cases.

Of the 12 cases who were previously treated for TB, nine cases (75.0%) were reported as having completed treatment and previous treatment outcome was not reported for the remaining three cases (25.0%).

Figure 17 shows the number of TB notifications by previous history of TB disease and year.

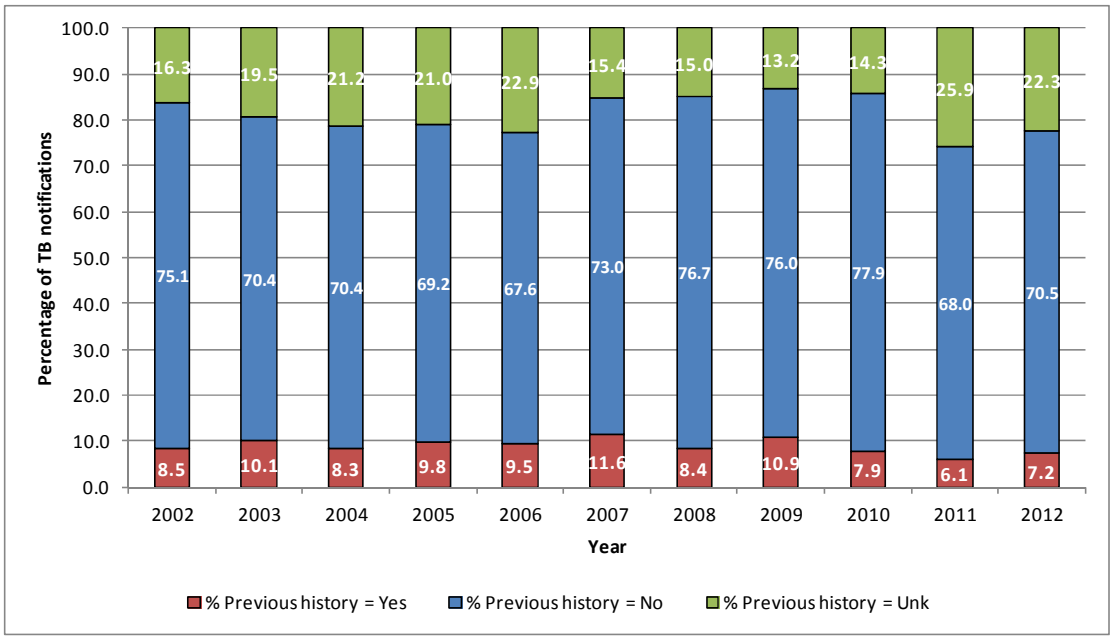

Figure 17: TB notifications by previous history of TB disease and year 2002-2012

TB Risk groups

During 2012, information on TB risk factors was reported for 291 (81.8%) cases, a decrease in comparison to the proportion reported in 2011 (86.9%). Of the 291 cases, 83 (28.5%) were reported as not having a risk factor for TB while 208 (71.5%) were reported as having one or more risk factor for TB.

The most commonly reported risk factors were being from a country of high TB endemicity[****] (n=146, 70.2%), followed by contact with a case of TB (n=64, 30.8%) and residence in an area of high endemicity (n=62, 29.8%). Other risk factors reported included substance misuse (n=45, 21.6%), co-morbidity with an immunosuppressive illness (n=25, 12.0%), treatment with immunosuppressive medication (n=14, 6.7%), co-morbidity with diabetes (n=8, 3.8%) and treatment with anti-TNF medications (n=3, 1.4%). A further 32 (15.4%) cases reported other or unspecified TB risk factors. Other TB risk factors specified (n=32) included, previous history of TB (n=6), family history of TB (n=6), co-morbidities (n=7), occupation (n=4), residence in a congregate setting (n=3), history of latent TB infection (n=1), pregnancy (n=1), tobacco use (n=2), poor economic circumstances (n=1) and traveller ethnicity (n=1).

Figure 18 shows the breakdown of TB cases with a reported risk factor by type of risk factor and year.

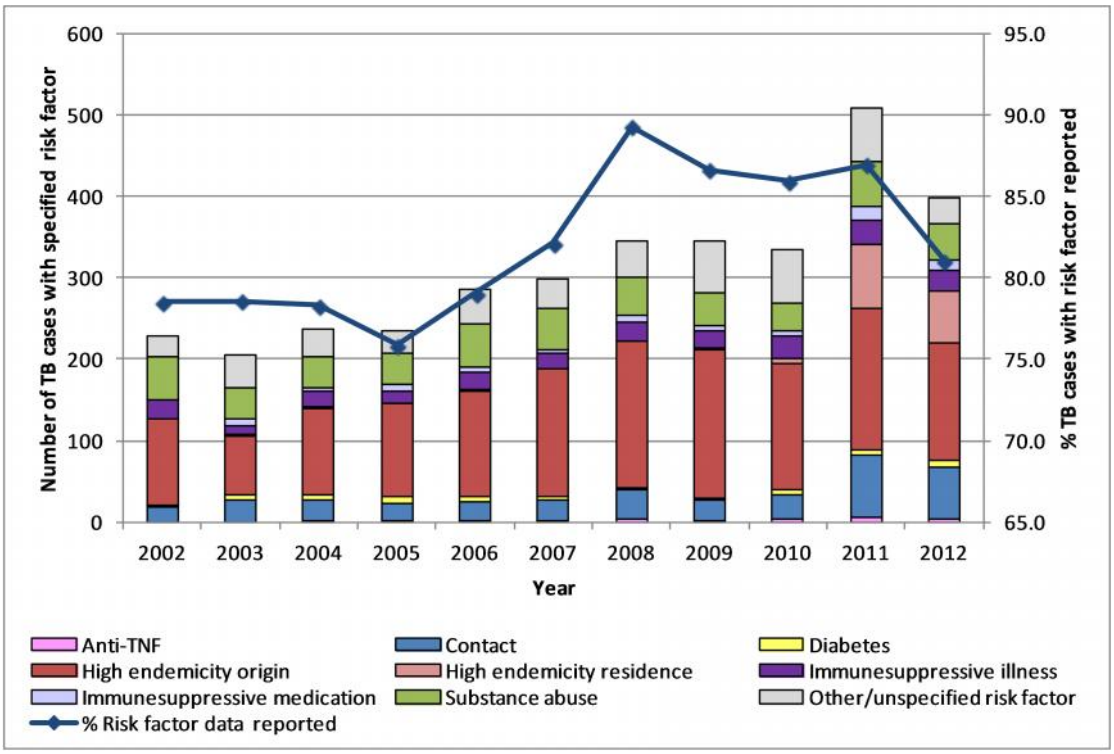

Figure 18: Number of TB notifications with a TB risk factor reported and percentage of TB cases with risk factor data reported, 2002-2012

[****] Countries with annual TB notification rate of > 40 cases per 100,000 population are considered areas of high endemicity.

HIV status

HIV status was reported for 100 (27.9%) TB cases in 2012. Of these, 15 cases (4.2% of total cases) were reported as HIV positive while 85 (23.7% of total cases) were reported as HIV negative. Information on HIV status was not reported or was unknown for 259 (72.1%) of cases during 2012, an increase from 66.8% of cases in 2011 with unknown HIV status (Figure 19).

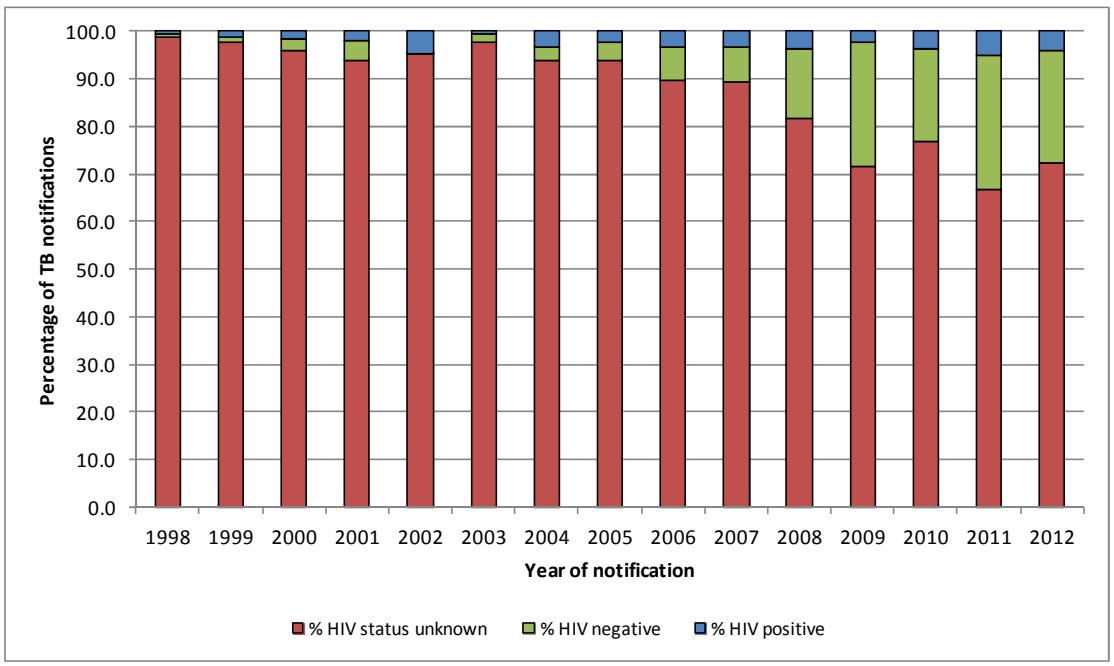

Figure 19: Percentage of TB notifications by HIV status and year, 1998-2012

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 2012, seven outbreaks of TB were reported to HPSC, with 24 associated active TB cases, four cases of latent TB infection (LTBI) and six hospitalisations (figure 20). Two outbreaks each were reported by HSE-M and – S while one outbreak each was reported by HSE-MW, - SE and –W (figure 21).

There were three general outbreaks during 2012, one of which occurred in an extended family, one was in a community setting and the remaining outbreak occurred across more than one location. There were also four family outbreaks, all of which occurred in private houses (figure 22).

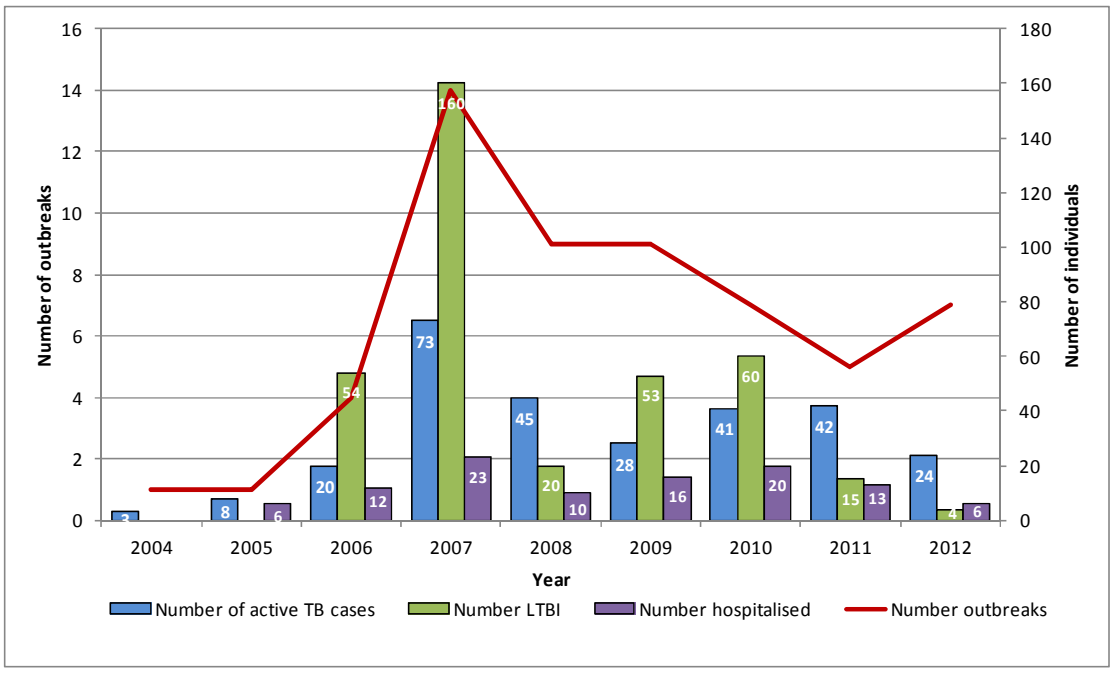

Figure 20: TB outbreak summary by year, 2004-2012

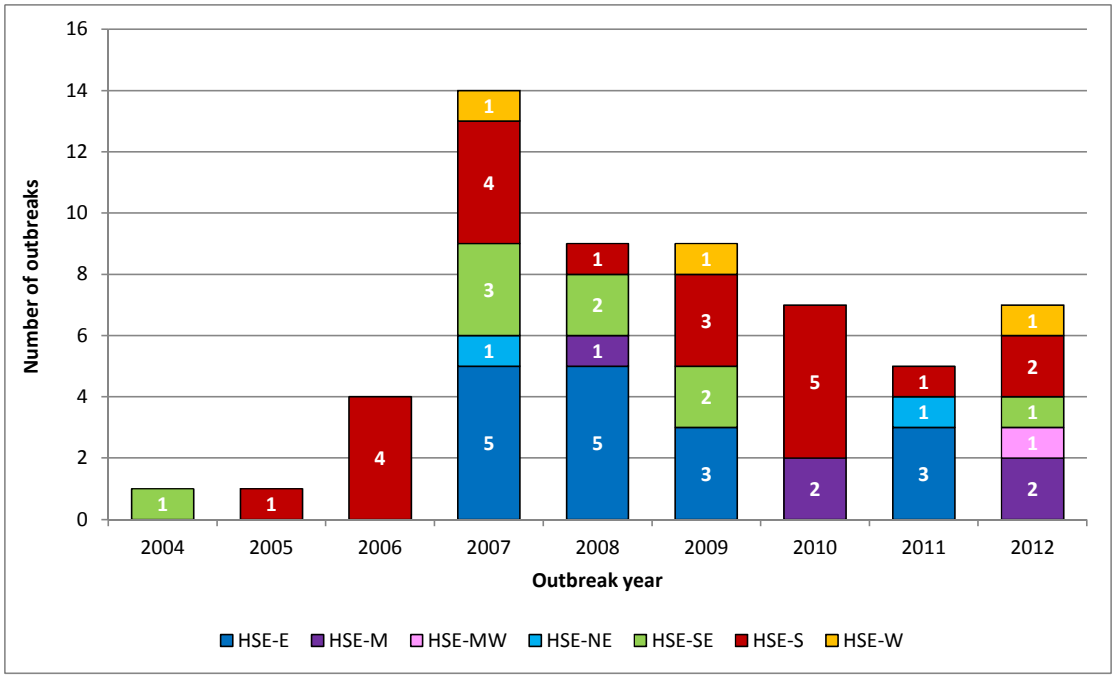

Figure 21: Number of TB outbreaks by HSE area and year, 2004-2012

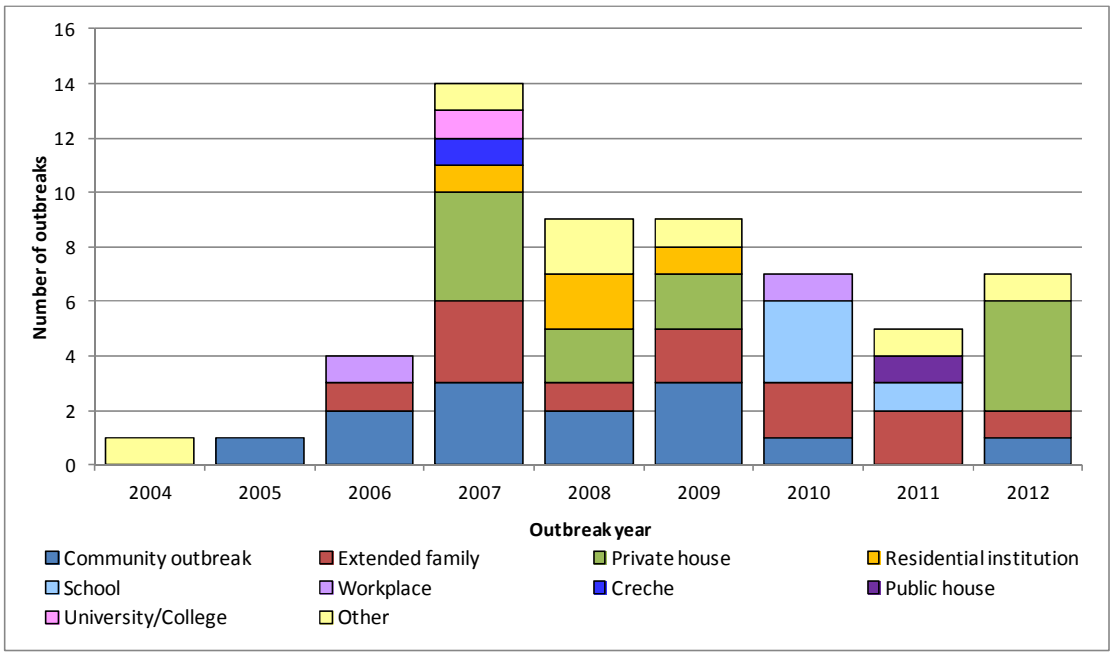

Figure 22: Number of TB outbreaks by location and year, 2004-2012

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 (any type) 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.[9] Table 27 compares the surveillance related Stop TB targets for 2015 with the case based enhanced surveillance data reported on the Irish TB notifications in 2012.

Table 27: WHO Stop TB target summary

WHO Stop TB target summary	2012 Irish notifications (%)	2015 WHO Target (%)
Percentage of patients with DST results – new cases††††	79.1	100.0
Percentage of patients with DST results – previously treated cases‡‡‡‡	73.0	100.0
Treatment success rate – total notifications	60.7	90.0
Percentage of cases with a HIV test result	27.9	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*.[11] 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 2012 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	2012 Irish notifications (%)	ECDC Target (%)
Percentage of new pulmonary cases culture confirmed	86.8	80.0
Percentage of new pulmonary culture confirmed cases with DST results	97.5	100.0
Treatment success rate – new pulmonary culture confirmed cases	67.7	85.0
Percentage of cases with a HIV test result	27.9	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 2009 and 2013, the mean annual percentage change in the TB crude notification rate in Ireland was -5.6%. Further analysis showed that the decline in the crude incidence rate between 2009 and 2013 is statistically significant (figure 23).

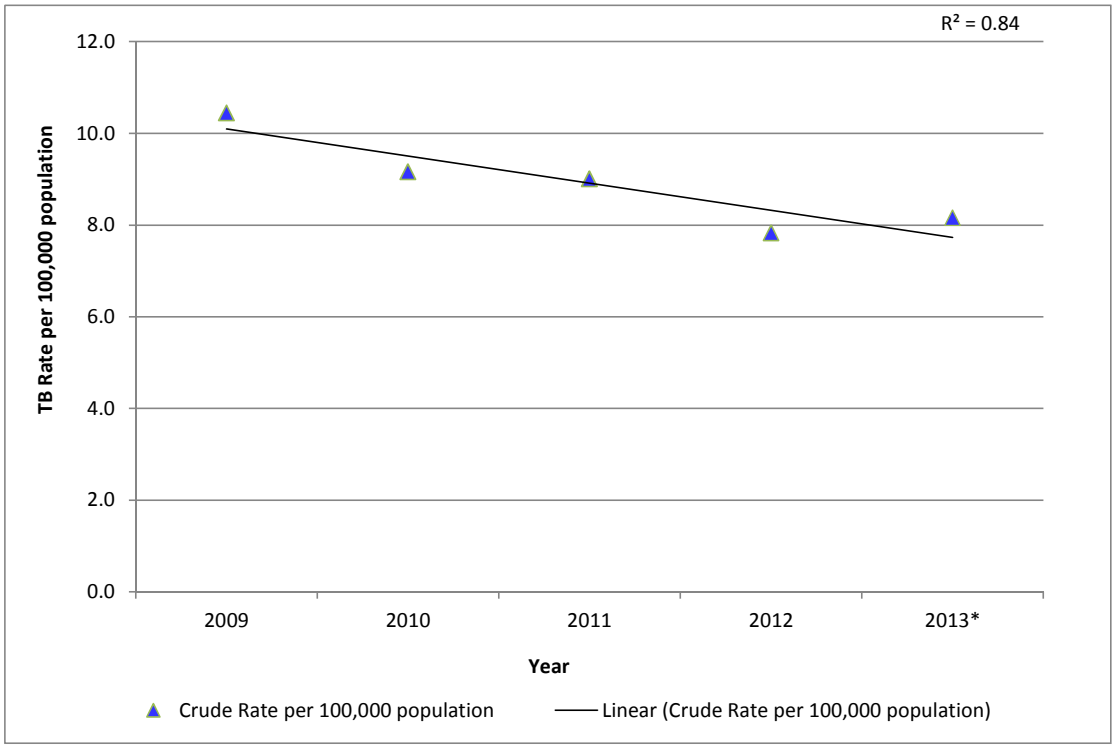

*Figure 23: Trend in national crude incidence rate (CIR), 2010-2013**

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 2004 and 2013, the Irish mean annual percentage change in the mean age of total TB notifications was -0.1 (figure 24). Further analysis showed that the mean age in all cases remained relatively stable in this time period. However an increase in the mean age of foreign-born case was significant. Mean age in Irish-born cases remained relatively stable in this time period.

When mean age was stratified by country of birth, it was found to be increasing among the foreign-born notifications but stable among Irish-born notifications. The reason for this increasing trend among the foreign-born is unclear. Possibilities include an aging settled immigrant population or an older immigrant population arriving in recent years.

The low mean age observed in 2007 was heavily influenced by an outbreak of 21 cases of active TB associated with childcare facility in HSE-S while the second lowest mean age occurred in 2010 when 3 school outbreaks were reported (2 in HSE-S and 1 in HSE-M).

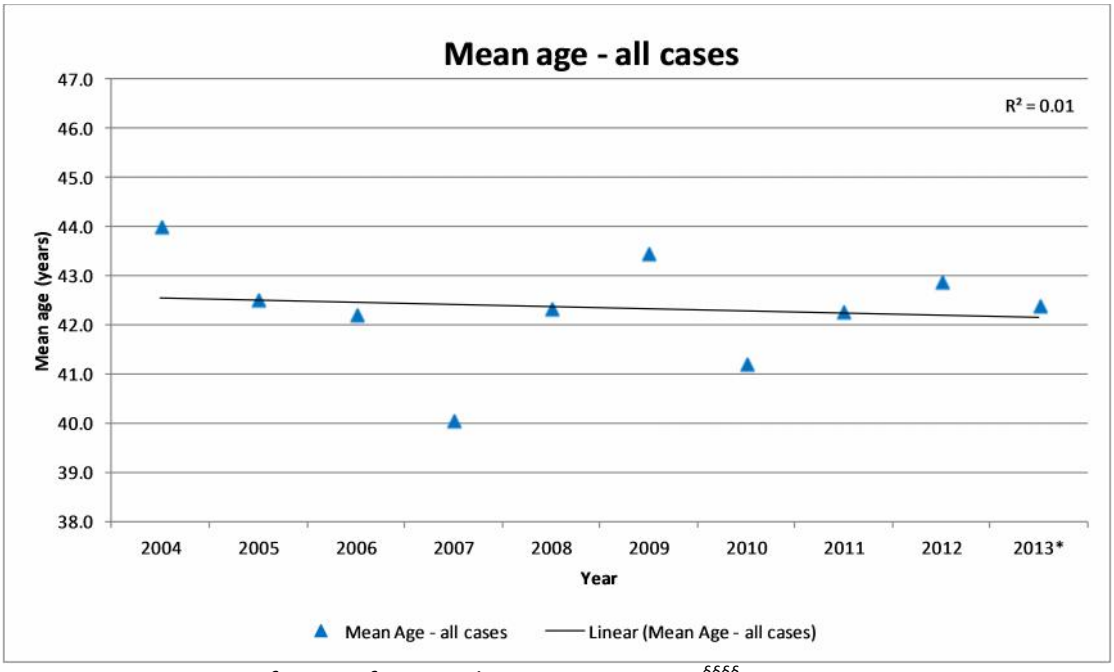

Figure 24: Mean age of TB notifications by year, 2004-2013[§§§§]

[§§§§] 2013 data are provisional

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 2004 and 2013 was 11.4%. However, further analysis showed that this was not statistically significant and the overall trend remained stable (figure 25).

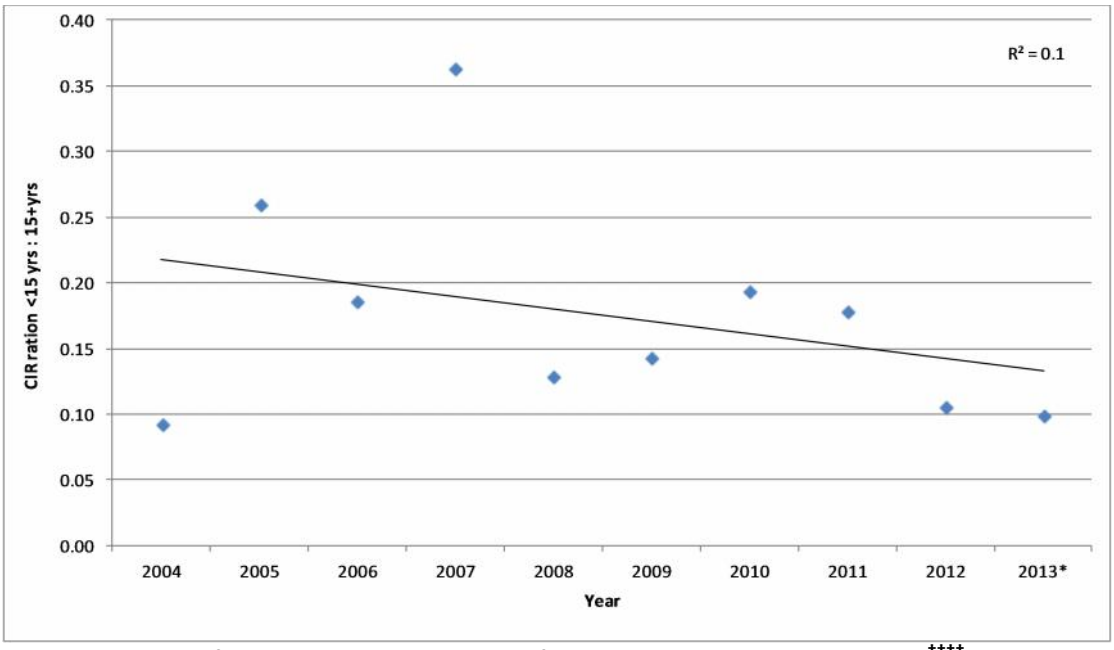

Figure 25: Ratio of paediatric to adult TB notification rates by year, 2004-2013‡‡‡‡

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 2009 and 2013, the mean annual percentage change in the Irish MDR-TB notification rate was 28.6% (figure 26). However, further analysis showed that this was not statistically significant. Provisional data for 2013 and 2014 indicate that numbers of MDR-TB cases have stabilised since 2008 to a low level with an average of 3 cases per annum. Due to the very small numbers involved, these data should be interpreted with caution.

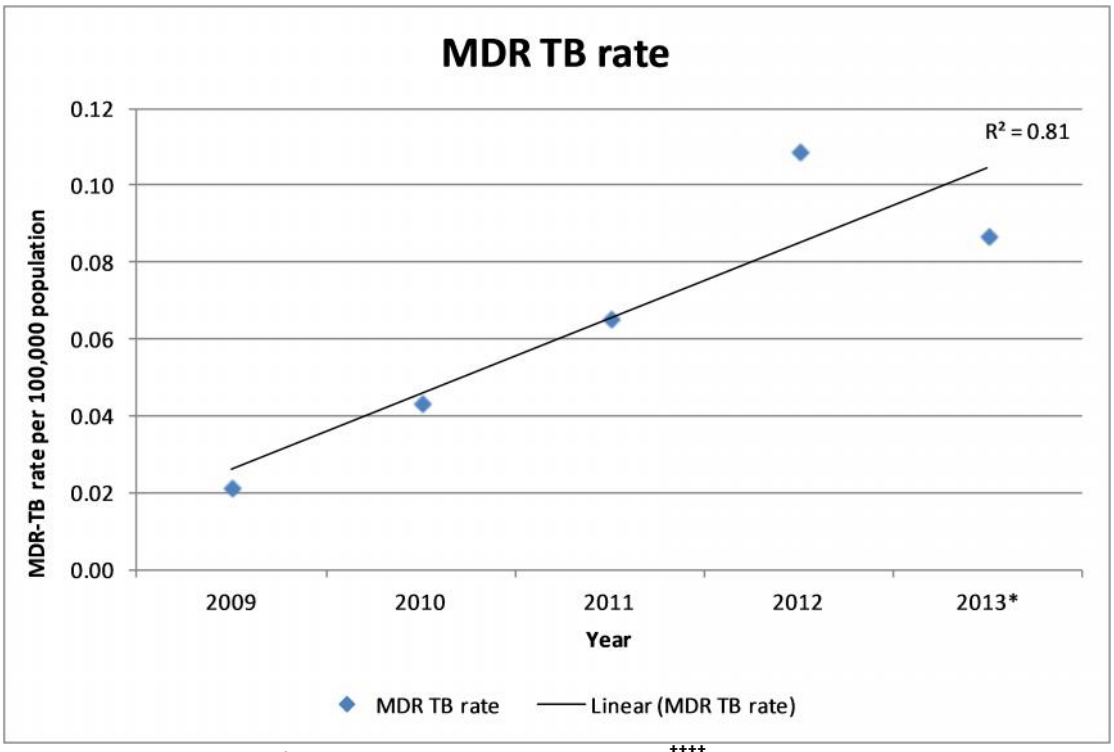

Figure 26: MDR-TB notification rates by year, 2008-2013[‡‡‡‡]

Conclusion:

Application of the above epidemiological monitoring indicators to the Irish TB data demonstrates that Ireland has not as yet achieved all of 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 2012, 359 cases of TB were notified to HPSC, a national crude incidence rate of 7.8 per 100,000 population. This is a decrease compared to 2011 (9.0 per 100,000) and is the lowest crude incidence rate recorded since TB surveillance began in 1998. Ireland now meets the WHO criterion for a low incidence country i.e. TB notification rate of less than 10 per 100,000.[12] The overall notification rate in countries of the EU and Western Europe who report to ECDC was 13.5 per 100,000 population in 2012, ranging from 3.4 per 100,000 population in Iceland to 85.2 per 100,000 in Romania.[2]

Differences in age-standardised TB incidence rates persist between HSE areas. In 2012, HSE South and HSE Midlands reported the highest rates. HSE North 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 West, Dublin North Central and Dublin South City in HSE East. According to the 2011 Census, between 23-27% of the population in Dublin city belong to social class 6 and 7 (see Appendix 3 for descriptions of social class).[7] This shows that the main burden of TB disease remains concentrated in large urban areas which is reflected elsewhere, e.g. in the UK rates in London, Leicester, Birmingham, Luton, Manchester and Coventry are more than three times the national average.[13]

During 2012, 44.6% of TB cases notified were foreign born. This is a small decrease compared to the proportion reported in 2011 (46.7%) and is the second highest reported since enhanced surveillance began in 2002. In 2012, among countries in the EU and Western Europe who reported data to ECDC, 26.8% of notifications were in foreign-born patients. In Austria, Cyprus, France and Norway, where crude incidence rates are similar to those reported in Ireland, the percentage of cases of foreign origin in 2012 ranged from 48.8-85.4%.[2]

The crude rate of TB notifications in the Irish-born population was 5.2 per 100,000 population which is a decrease compared to the rates reported in 2011 (5.7) and in 2010 (6.5). The crude rate in foreign-born cases was 20.9 which is a decrease compared to the rate reported in 2011 (25.2). The rate in the foreign-born continues to decrease since peaking in 2008 at 33.0.

The highest age-specific rates (per 100,000) in 2012 occurred among those aged 25-34 years (10.5) followed by those aged 65 years and older (10.3). This is the fourth consecutive year where a decrease has been observed in those aged 65 years and older. Age specific rates decreased in all age groups except in those aged 15-24 years and 55-64 years.

Rates among males were higher than females for all age groups except for those aged 15-24 years. In 2012, the highest rate in females was in those aged 25-34 years (10.1) and the highest rate among males was in those aged 55-64 years (15.1). The male to female ratio (1.5:1) reported in 2012 was consistent with the rate reported in 2011 (1.4:1). Males are predominant among TB cases in nearly all European countries with an overall M:F ratio of 1.8:1 in 2012.[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 51 years. In foreign-born cases, the peak occurred in those aged 25-34 years with a median age of 33 years. The majority of foreign-born cases were from Asia (45.0%) and Africa (29.4%).

There were three cases of TB meningitis all of whom were adults reported in 2012 corresponding to a crude rate of 0.7 per million population. Between 1998 and 2012, 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* recommends that the cessation of neonatal BCG vaccination should be considered if certain criteria are met.[3] 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 2007 and 2012, there were two cases of TB meningitis reported in children aged less than five years, giving an average notification rate of 0.9 per 10 million population. The criteria for discontinuation of BCG vaccination and how they apply to Ireland are outlined in Appendix 4.[14]

Pulmonary TB was reported in over two thirds of cases (71.0%) and 29.0% had exclusively extrapulmonary TB. Of the pulmonary cases, 46.3% were sputum smear positive and the sputum smear-positive rate for 2012 was 2.6 per 100,000 population. Sputum microscopy results were available for 165 (64.7%) of the 255 cases. This remains stable in comparison with 2011 (65.1%) but remains below the mean proportion of 75.1% of pulmonary cases with sputum microscopy available between 2002 and 2011 (range 64.4-83.7%).

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 255 cases with a pulmonary component 85.3% were culture confirmed, an increase of 11.2% in comparison to 2011. The proportion of new pulmonary cases that were culture confirmed was 86.7%, an increase of 8.5% compared to 2011. This exceeds the EU monitoring framework target of ≥ 80% culture confirmation among new pulmonary TB cases.[11] This is a positive improvement and the first time that this target has been reached in Ireland. Every effort must be maintained to sustain this. Among countries in the EU and Western Europe who reported data to ECDC, the culture confirmed proportion ranged from 34.5% (Malta) to 92.8% (Slovenia).[2]

During 2012, 10.3% (37 cases) of all TB cases reported to HPSC were either culture unknown (23 cases) or culture not done (14 cases). This is the second lowest proportion of TB cases without a culture result reported since enhanced surveillance began in 2002. It is crucial 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 decreased in 2012, with four cases (1.4% of culture confirmed cases) notified. This compares to six cases (2.2%) notified during 2011 and 12 (4.3%) during 2010. Between 2002 and 2012, *M. bovis* detections accounted for 2.2% of all culture confirmed cases, with a mean of seven *M. bovis* cases notified annually. During 2012, 127 *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 0.1 per 100, 000 population.

The proportion of new culture confirmed pulmonary cases with reported drug sensitivity testing (DST) results increased from 94.2% in 2011 to 97.4% in 2012. This is just below the EU monitoring framework action plan target of 100% of new culture confirmed pulmonary cases with DST results.[11] 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] Ireland achieved this target in 2012, with 100% of culture positive cases that were previously treated for TB having DST results. It is important that we continue to improve the quality of data relating to DST results in order to accurately assess the performance of the TB control programme.

Of the 22 resistant cases reported during 2012, five cases had MDR-TB which is a slight increase in comparison with recent years with three reported in 2011 and two in 2010. MDR-TB cases and cases resistant to isoniazid represented 1.4% and 3.3% of total cases respectively. This compares to 0.7% and 4.4% respectively in 2011. In 2012 the proportion of cases with MDR-TB was 4.6%, ranging from 0.0-19.8% 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 2012.

The rate of resistance was higher in foreign-born than in Irish-born cases. The rate of resistance in foreign-born cases has steadily increased between 2006 and 2011, while the rate of resistance in Irish-born cases has remained stable during the same period. The majority of resistant cases in Ireland in 2012 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 this context, focus on the surveillance, prevention and treatment of drug resistance needs to be strengthened in all countries.

In recent years, the quality of the data, and in particular, data on treatment outcome, had greatly improved. However, in 2012 treatment outcome was provided for only 77.7% of total cases notified. This is the fourth lowest reported since enhanced surveillance was initiated in 2000. This may be explained by the fact that information on treatment outcome was unavailable for 79.2% of cases within one region and for approximately 30% in two other regions. It is extremely important to maintain and improve on the provision of treatment outcome data. A concerted effort is required by clinicians and Public Health involved in TB treatment and control to prioritise the provision of these 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.[9, 11]

The proportion of total cases where outcome was reported as completed (60.7%) increased slightly during 2012 compared to 2011 (58.8%) (range 58.8-72.4%). This also falls short of the WHO Stop TB target of above 90% reported treatment success for all TB cases.[9]

The proportion of new culture confirmed pulmonary TB cases where outcome was reported as treatment completed was 67.9%, which was a slight increase compared to 2011 (65.6%). This is also below the ECDC EU target of successfully treating 85% or more of all new culture confirmed pulmonary TB cases.[11] 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.

Treatment outcome was not reported for 10 (45.5%) resistant cases. The treatment success rate for the MDR-TB cases treated in the 2011 cohort was 66.7% as one case was lost to follow up. This further reiterates the need for more complete outcome data to assist with TB control in Ireland. During 2003 to 2010, 84.0% of MDR-TB cases successfully completed treatment, meeting the WHO Stop TB target of 75% treatment success for MDR-TB cases.[9]

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

Reported information on TB risk factors has steadily increased from 75.9% in 2005 to 86.9% of all cases during 2011. During 2012, 81.1% of cases reported information on risk factors. The proportion of cases with one or more reported TB risk factor(s) has also increased during this time period, from 60.9% in 2005 to 82.5% in 2011. During 2012, 71.5% of the cases with risk factor information completed, reported having one or more TB risk factors. The three most commonly reported risk factors were being from a country of high TB endemicity (annual TB notification rate of ≥ 40 cases per 100,000 population), followed by residence in a country of high TB endemicity and contact with a TB case. These data are important as they provide information to guide policy for targeting prevention and control 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 27.9% of cases during 2012, a decrease on the proportion reported in 2011 (33.2%). 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 HIV status reported.[9, 11] 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. Work is ongoing in this regard.

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 all of 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 2013 and 2014 indicate that the numbers of MDR-TB cases have stabilised since 2008 to a low level with approximately two to three cases per annum. Due to the very small numbers involved, these data should be interpreted with caution.

Ireland now meets the criterion (TB notification of < 10 cases per 100,000) as set out by the WHO for a low incidence TB country. In November 2014 the WHO published an action

framework for low incidence countries towards TB elimination which includes targets and a strategy.[12] The framework states that low incidence countries need to progress further towards “pre-elimination” (< 1 case per 100,000) by 2035 and to elimination (< 1 case per million) by 2050. Close collaboration will be needed between countries with high and low incidences of TB. To achieve the aforementioned goals, a multi-sectoral approach is required. This will include better access to high-quality diagnosis and TB care and more effective TB prevention including addressing the social determinants of TB with special attention to groups at highest risk of TB.

The importance of good surveillance data cannot be underestimated in this context. Such data 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 to reach the global “pre-elimination” and elimination targets by 2035 and 2050 respectively.

References

1. World Health Organization. *Global Tuberculosis Control 2013*. WHO, Geneva, Switzerland. 2013. Available at: http://www.who.int/tb/publications/global_report/en/

2. European Centre for Disease Prevention and Control/WHO Regional Office for Europe: *Tuberculosis surveillance in Europe 2013*. Stockholm, European Centre for Disease Prevention and Control, March 2013. Available at: http://ecdc.europa.eu/en/publications/Publications/Forms/ECDC_DispForm.aspx?ID=841

3. Health Protection Surveillance Centre. *Guidelines on the Prevention and Control of Tuberculosis in Ireland 2010*. National TB Advisory Committee. April 2010. Available at: http://www.hpsc.ie/hpsc/A-Z/VaccinePreventable/TuberculosisTB/Publications/File,4349,en.pdf

4. Department of Health, 2011. Infectious Diseases (Amendment) Regulations 2011 (S.I. No. 452 of 2011) (Sept 2011). Available at: http://www.irishstatutebook.ie/2011/en/si/0452.html and http://www.hpsc.ie/hpsc/NotifiableDiseases/CaseDefinitions/

5. World Health Organization. *Definition of a new sputum smear-positive TB case*. 02/04/2007. Geneva, Switzerland. Available at: http://www.who.int/tb/dots/laboratory/policy/en/index1.html

6. World Health Organization, *Global Task Force on XDR-TB, outcomes and recommendations*, October 2006. Available at: http://www.who.int/mediacentre/news/notes/2006/np29/en/index.html

7. Central Statistics Office, Dublin. Census 2011. Dublin, 2012.

8. HSE Health Atlas. Available at: https://www.healthatlasireland.ie/

9. Stop TB Partnership. *The Global Plan to Stop TB 2011-2015*. World Health Organisation. Geneva, 2011. Available at: http://www.stoptb.org/global/plan/

10. World Health Organization. *Roadmap to prevent and combat drug-resistant tuberculosis. The consolidated action plan to prevent and control multidrug- and extensively drug-resistant tuberculosis in the WHO European Region, 2011-2015*. WHO, Geneva, Switzerland. 2011. Available at: http://www.euro.who.int/en/what-we-publish/abstracts/roadmap-to-prevent-and-combat-drug-resistant-tuberculosis

11. European Centre for Disease Prevention and Control. P*rogressing Towards TB Elimination. A follow up to the Framework Action Plan to Fight Tuberculosis in the European Union*. ECDC Stockholm, November 2010. Available at: http://ecdc.europa.eu/en/publications/Publications/101111_SPR_Progressing_towards_TB_elimination.pdf

12. World Health Organization. Towards tuberculosis elimination: an action framework for low-incidence countries. Geneva, 2014. Available at: http://www.who.int/tb/publications/elimination_framework/en/

13. Tuberculosis in the UK: Annual report on tuberculosis surveillance in the UK, 2014. London: Public Health England, August 2014. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/360335/TB_Annual_report__4_0_300914.pdf

14. International Union against Tuberculosis and Lung Disease. *Criteria for discontinuation of vaccination programmes using Bacille Calmette-Guerin (BCG) in countries with a low prevalence of tuberculosis. A statement of the International Union against Tuberculosis and Lung Disease*. Tuber Lung Dis, 2004; **75**(3): 179-80.

Appendix 1: TB Cases Notified in Ireland in 2013, Provisional Data (as of 19th August 2014)

There were 381 cases of TB provisionally notified in 2013. 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, 2013

Parameter	Number (Rate/100,000)	% of Total
Total number of cases	381 (8.3)	n/a
Cases in Irish-born population*****	205	53.8
Cases in foreign-born persons	169	44.4
Culture positive cases	280	73.5
Pulmonary cases	253	66.4
Smear positive pulmonary cases	130	34.1
Multi-drug resistant cases	3	0.8
Mono-resistant to isoniazid	18	4.7
Deaths attributable to TB	6	1.6
TB meningitis cases	2	0.5

Crude incidence rates by HSE area

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

Table A2: Provisional TB cases in each HSE area, 2013

HSE Area	Number of cases	Crude rate per 100,000	95% CI for rate
HSE E	150	9.3	7.8 - 10.7
HSE M	16	5.7	2.9 - 8.4
HSE MW	32	8.4	5.5 - 11.4
HSE NE	30	6.8	4.4 - 9.2
HSE NW	17	6.6	3.5 - 9.7
HSE SE	32	6.4	4.2 - 8.7
HSE S	68	10.2	7.8 - 12.7
HSE W	36	8.1	5.4 - 10.7
Ireland	**381**	**8.3**	**7.5 - 9.1**

***** Country of birth missing for 7 cases.

Age and sex
There were 139 cases (36.5%) of TB notified in females and 240 cases (63.0%) in males, giving a male to female ratio of 1.7:1. Sex was not reported in two cases. The mean age of cases notified was 42.4 years (range 0 to 88 years).

Geographic origin
Irish-born cases accounted for 53.8% (n=205) while foreign-born cases accounted for 44.4% (n=169). Information on country of birth was not reported for 7 cases (1.8%).

Site of disease
Pulmonary TB was diagnosed in 229 cases (60.1%), extrapulmonary TB in 128 cases (33.6%) and pulmonary and extrapulmonary TB in 24 cases (6.3%). Of the 253 cases with a pulmonary disease component, 207 (81.8%) were culture positive and 130 (51.4%) were smear positive.

TB meningitis
There were two cases of TB meningitis provisionally notified in 2013 giving an incidence rate of 0.04 per 100,000 population (0.4 per million population). One was in the 35-44 year age group and one was in the 45-54 year age group. One case was foreign-born, both cases were culture positive but BCG vaccination status was unknown for both.

Culture
Of the 381 cases provisionally notified in 2013, 280 (73.5%) were culture confirmed.

Species
Among the 280 culture positive cases, 261 (93.2%) were *M. tuberculosis,* four (1.4%) were *M. africanum,* six (2.1%) were *M. bovis.* The remaining nine cases (3.2%) were reported as *M. tuberculosis* complex without further speciation.

Antibiotic resistance
Of the 280 culture positive cases, DST results were available for 270 cases (96.4%). Of the 270, 35 were resistant, including three cases (0.8% of total cases, 1.1% of culture positive cases) of MDR-TB and one case of XDR-TB. Mono-resistance to isoniazid was reported in 18 cases, to streptomycin in eight cases and to pyrazinamide in one. Three cases were resistant to both isoniazid and streptomycin and one was resistant to isoniazid, streptomycin and pyrazinamide.

Appendix 2: Completeness of data, 2012

Completeness of data reported for 2012 notifications ranged from 100.0% (diagnostic type and isolate for culture positive cases) to 27.9% (HIV status) depending on the variable analysed. Of the 17 key variables analysed, 10 had completeness levels of 90% or more. Table A3 shows the completeness of reporting for 17 key variables during 2012.

Table A3: Completeness of reported data by variable

Variable	% Complete
Age	99.7
Sex	99.7
Diagnostic type	100.0
Country of birth (all notifications)	99.2
Sputum smear result (pulmonary cases)	90.2
Culture result	93.6
Isolate (Culture positive cases)	100.0
Isoniazid sensitivity result (Culture positive cases)	98.2
Rifampicin sensitivity result (Culture positive cases)	98.6
Case finding method	97.8
Treatment outcome	77.7
Risk group	81.1
Previous history of TB (all cases)	77.7
Previous year of TB diagnosis (previously diagnosed cases)	88.5
Previous TB treatment history (previously diagnosed cases)	57.7
Previous TB treatment outcome (previously treated cases)	75.0
HIV status	27.9

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),[13] 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 the HPSC in the 1998 National TB Report. The 2012 report is the fifteenth national TB report produced by the 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 2012, the national rate for sputum smear positive pulmonary TB was 2.6 per 100,000 population while in 2011, 2010 and 2009 the rates were 2.6, 2.4 and 3.0 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 (2008-2012), the average annual notification rate of TB meningitis in children aged less than five years was 0.9 per 10 million general population. Between 2008 and 2012, there were two cases of TB meningitis in children under five years of age (both 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 2012 age-specific incidence rate for children 0-14 years was 1.0 per 100,000.

Index of Tables and Figures

Tables

Figures:

Health Protection Surveillance Centre

25-27 Middle Gardiner Street
Dublin1
Ireland

Ph +353 1 876 53 00
Fx + 353 1 856 12 99
E hpsc@hse.ie

www.hpsc.ie