Vol. 12(2), pp. 172-178, April - June 2020
DOI: 10.5897/JPHE2019.1198
Article Number: EC6882663975
ISSN 2141-2316

http://www.academicjournals.org/JPHE

ACADEMIC JOURNALS
expand your knowledge

Journal of Public Health and Epidemiology

Full Length Research Paper

Epidemiology of tuberculosis in the Somme Department, France five years after implementation of the French National Tuberculosis Program

Pauline Kiswendsida Yanogo[1,2*], Jean-Luc Schmit[2], Anne Sophie Fresse[3], Nicolas Meda[1] and Olivier Ganry[4]

[1]Department of Public Health, Faculty of Medicine, University of Ouagadougou, Burkina Faso.
[2]Department of Infectious Diseases, Faculty of Medicine, Amiens University Hospital, Amiens, France.
[3]Center for Prevention of Communicable Diseases, Amiens University Hospital, Amiens, France.
[4]Epidemiology and Public Health Service, Amiens University hospital, Amiens, France.

Received 12 December, 2019; Accepted 26 May, 2020

In order to assess the measures involved in the control of tuberculosis in the Somme Department, France, five years after the implementation of the French National Tuberculosis Program, we found it essential to describe the precise epidemiology on this disease. All reported cases of tuberculosis between 2007 and 2011 were retrospectively included and a descriptive analysis of the incidence of the disease and patients' characteristics was conducted. 175 cases were reported. After an increase in the incidence of TB (x10^5) between 2007 and 2008 from 5.8 to 6.8, it has steadily declined for 2 years (4.9 in 2010) before rising in 2011 with a record of 7.6. In 2010 and 2011, the incidence in children aged less than five years old, respectively 5.7 and 8.5 was greater than the incidence of the department (p=0.8). Approximately 7% of cases were diagnosed during an investigation around a case of tuberculosis and 6.3% in targeted screening. Among tuberculosis cases with pulmonary localization (145 cases), 57.7% patients had positive sputum smear. After the suspension of the compulsory BCG vaccination, particular attention must be paid in children during a screening procedure around a case of tuberculosis.

Key words: Tuberculosis, epidemiology, Somme, France.

INTRODUCTION

Tuberculosis is a global public health issue because of its incidence and death toll (World Health Organization, 2018). In France, according to the Institut de Veille Sanitaire, the incidence of tuberculosis disease has strongly decreased from 60 cases per 100,000 inhabitants in 1972 to less than 10 cases per 100000 inhabitants (9.9/10^5) in 2003. In 2010, the incidence of reported tuberculosis cases was 8.1 cases for 100,000

*Corresponding author. E-mail: y_poline@yahoo.fr. Tel: +226 70 70 93 79.

Table 1. Distribution of TB cases per year in the Somme Department, France.

Year of declaration	2007	2008	2009	2010	2011
Number of notified cases	33	39	31	28	44

inhabitants. In the Somme Department, the incidence of TB from 2001 to 2010 dropped from $7.0/10^5$ to $3.5/10^5$ inhabitants (Santé Publique France). There is no current study of the precise epidemiology of tuberculosis in this French Department. In 2007 compulsory BCG vaccine was suspended and the National Tuberculosis Program (NTP) started. There is a need to study the epidemiological profile of TB cases that have occurred in the region for this period. This study will give a description in time, place, and person of the cases of diagnosed TB in order to better guide the actors of the fight against TB in their strategies. This study is part of a general assessment framework of control methods in the Somme Department after these changes. The objective of this study is to describe the epidemiology of tuberculosis in Somme Department between 2007 and 2011.

MATERIALS AND METHODS

This is a retrospective cohort study of TB cases done in the Somme Department between 1st January, 2007 and 31st December, 2011. All tuberculosis cases which have been reported from January 1st, 2007 and December 31st, 2011at the Regional Health Office (RHO) for the Tuberculosis Control Center (TBCC) of the Somme Department were included. Since 2006, any biologist, clinician or any other doctor informed of a case of TB must report it (immediate reporting to the TBCC and the RHO) as soon as possible (Groupe de travail et al., 2006). In the Somme Department, the RHO receives mandatory reports and forwards them to TBCC, triggering an investigation into identification of the contacts of the cases of TB and their screening. Notified patients had been contacted by the TB Control Center which collected all information concerning the cases and their contacts. All reported cases of non-tuberculous mycobacteria or other diagnoses (sarcoidosis, cancer) were excluded. Cases which were diagnosed in the Somme Department but living outside the department were excluded.

Data collection

The socio-demographic data, date of diagnosis/treatment and compulsory notification, clinical (existing history of tuberculosis, severity of the disease) and resistance profile to major antibiotics of all cases were indicated. In addition, information on birth places of the patients and their parents, dates of birth, and general living conditions was collected. The data were collected from compulsory reporting as well as paper and computerized medical files which had been informed by the TBCC staff after notification by the RHO.

Statistical analysis

A descriptive analysis of the incidence of tuberculosis according to the socio-demographic, clinical and bacteriological characteristics of cases was performed with the statistics software SAS 9.3®. The incidence was determined using the data of the annual population estimates of the French National Insitute of Statistics and Economic Studies from 2007 to 2011 which were published in January 2009 to 2013.

RESULTS

Populations

From January 1st, 2007 to December 31st, 2011, 190 cases were reported at the Regional Health Office. Fifteen declarations were excluded as stated by the protocol; 8 from other departments, 4 from the Somme Department but infected by atypical mycobacteria and 3 from other diagnoses. The total number of cases analyzed was therefore 175. After an increase in the number of TB cases between 2007 and 2008 from 33 to 39 (Table 1), there was a constant drop during 2 years (28 in 2010) and a high increase in 2011 with a record of 44 cases.

Clinical and bacteriological characteristics of the cases of TB

The context of diagnosis was filled for 99.4% (174/175) of the reported cases of TB. For 86.7% of the cases, the diagnosis was made when the patients were admitted at the public hospitals. For 6.9% of the cases, it was during an investigation around a case and for 6.3%, during a test (screening of foreigners from an endemic tuberculosis area, screening before employment).

Previous history of tuberculosis was filled for 85.1% (149/175) of the reported cases; 23.4% of them had a family history of TB, 9.4% had a personal history and 1.3% a family and a personal history. We were not able to isolate the percentage of those with a history of tuberculosis treated with anti-tuberculosis drugs (Table 2). The severity of tuberculosis was filled in 98.8% of the reported cases (173/175); 4.0% (7/173) of them presented a severe type including two children under 5 years whom had tuberculosis meningitis in 2010. The result of the direct bacteriological examination of bronchial secretions was available for 91.4% of the patients (160/175). Among those suffering from pulmonary or mixed localizations, the result was positive for 57.7%. As expected, the result was negative for all extra-pulmonary tuberculosis cases.

Table 2. Principal characteristics of reported tuberculosis cases, Somme Department (2007-2011).

Variables	No.[a]	%
Sex		
Male	113	-64.6
Female	62	-35.4
Age group (years)		
< 5	8	-4.6
14-May	4	-2.3
15-24	22	-12.6
25-44	54	-30.9
45-64	48	-27.4
≥ 65	39	-22.3
Country of birth		
France	109	-62.3
France from foreign parents	8	-4.6
Other	58	-33.1
Housing		
Individual	141	-80.6
Collective	30	-17.1
Homeless	4	-2.3
Context of diagnosis		
Spontaneous use of care system	151	-86.8
Survey around a case	12	-6.9
Other screening	11	-6.3
History of TB		
No	98	-65.8
Family	35	-23.5
Individual	14	-9.4
Individual and family	2	-1.3
TB localization		
Pulmonary	145	-83.8
Extra-pulmonary only	28	-16.2
Type of disease		
Simple	166	-96
Severe	7	-4
AFB[b] smear		
Positive	82	-48.2
Others[c]	88	-51.8

a: Number, b: acid-fast bacilli, c: Negative (+ Extrapulmonary only without AFB)
Source: TB mandatory reporting data in the Somme Department.

The annual incidence of TB

The incidence was determined using the data of the annual population estimates of the French National Institute of Statistics and Economic from 2007 to 2011 published in January 2009 to 2013. The evolution of the incidence is superimposable with the annual total numbers (Figure 1). After a non-significant increase

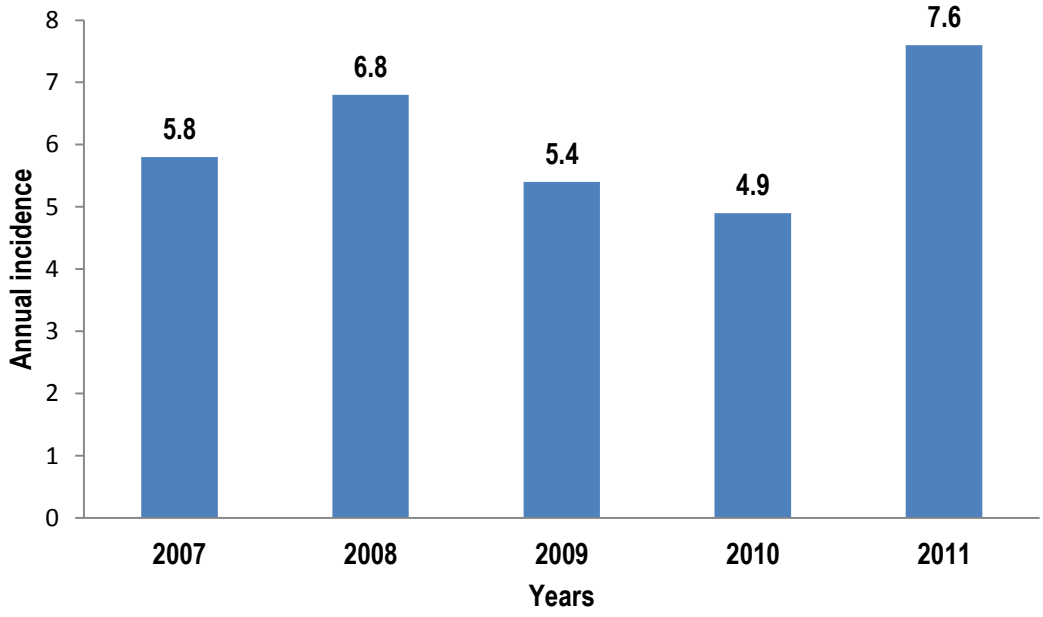

Figure 1. Annual TB incidence (per10^5) in the Somme Department, 2007-2011.
Source: TB mandatory reporting data in the Somme Department.

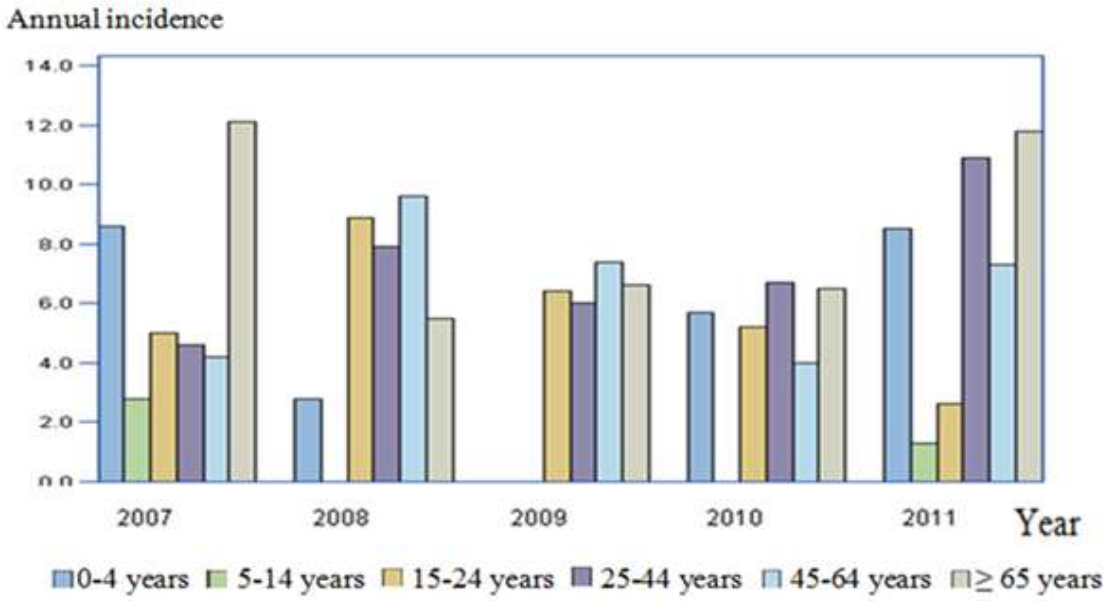

Figure 2. Annual TB incidence by age group per 100, 000 person-years in the Somme 2007-2011.
Source: TB mandatory reporting data in the Somme Department.

(*p=0.48*) in the incidence of TB cases between 2007 and 2008 from 5.8 to 6.8 cases per 100000 inhabitants, there was a constant drop during 2 years (5.4/10^5 in 2009, 4.9/10^5 in 2010; p=0.17 versus 2008), before rising again in 2011 with a record of 7.6 cases/10^5 inhabitants (p=0.06 versus 2010).

Incidence of TB according to socio-demographic characteristics

The annual incidence by age is similar to the whole population, except in the 15 to 24 years old group (Figure 2). Annual incidence is constantly the lowest in the 5 to

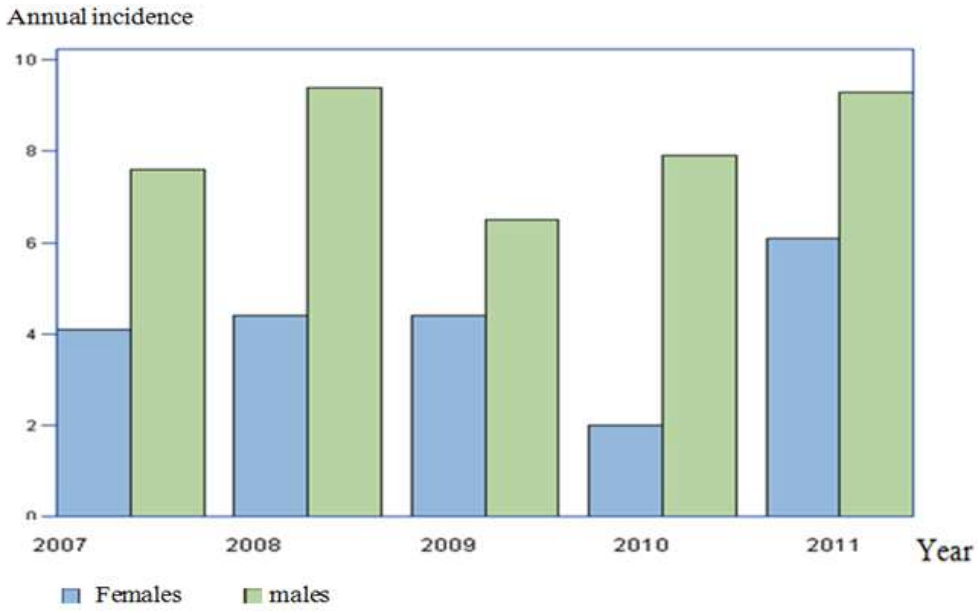

Figure 3. Annual TB incidence by sex/10^5 person-years in the Somme Department, 2007-2011.
Source: TB mandatory reporting data in the Somme Department.

14 years old group. Most of the time, the highest incidences were recorded in age groups above 45 and 65 or more (8.6/10^5 and 12.1/10^5 respectively).

Concerning all the time periods (Figure 3), the incidence among men was higher than women reaching more than the double in 2008 (9.4/10^5 versus 4.4/10^5; p=0.02) and almost four times in 2009 (7.9/10^5 versus 2/10^5). The largest proportion of TB cases (62.2%) were people born in France; TB cases were reported among people born abroad, which represented more than a third (33.1%) of the population in the Somme Department. People born in France from foreign parents accounted for 4.5% of the cases. Indeed, the number of foreigners (among TB cases) has started to rise in 2010: 35.7% compared to 25.8% in 2009 reaching 38.6% in 2011 (p=0.2). When the cases were reported, 80.5% of them lived in their personal housing, 17.1% were in the community and 2.2% were homeless (Table 2).

DISCUSSION

This study conducted on 175 cases analyzed the epidemiology of tuberculosis from 2007 to 2011 in the Somme Department. After an increase in the number of TB cases between 2007 and 2008 (18.2%), there was a constant drop during 2 years (respectively -20.5% and -9.7%) before rising in 2011 with a record growth of 57.1%. This trend can also be observed at the national level (Che and Antoine, 2011; Valin and Chouaïd, 2012). This drop in the number of TB cases was also observed at the European level where the incidence rate in 2009 was the lowest since 1995 (Hollo et al., 2011). The initial increase may be explained by a real increase in the number of cases and/or an improvement in the detection and declaration of cases. The reorganization of the activities dealing in the fight against TB and the implementation of the NTP in 2007 were considered as possible causes of the decrease of TB cases at the national level (Che and Antoine, 2011). The same reasons can explain the increase in the number of cases recorded in the Somme Department. However, the rise observed in the Somme Department was very high, about three times higher than that of the national one (Che and Antoine, 2011).

Different reasons could explain the downward trend in 2009-2010, namely a change in the detection of cases and anti-tuberculosis policies, potential monitoring tools or a better fight against tuberculosis with the establishment of the NTP in 2007. In the Somme Department, notifiers may have lowered their efforts in declaring cases of TB. In 2009 and 2010, the TBCC continued screening people at risk in shelters and that could have led to an increase in the number of cases. However, the implementation of the survey conducted in 2007 limited the transmission by an early detection of secondary cases and the treatment of latent TB infection (LTBI) (Valin and Chouaïd, 2012). The number of LTBI treated by the TBCC of the Somme Department rose from 17 in 2007 to 91 in 2008 and then to 72 in 2009, 40 in 2010 and 73 in 2011. If it is considered that the risk to develop the disease after infection is 10% during one's life time with a higher incidence in the first 2 years (World

Health Organization, 1972), treatment of these infections in 2008-2009 could have contributed to reduce significantly the spread of TB between 2009 and 2010 in the Somme Department. When the increase in the number of TB cases in the Somme Department in 2011 differed from the drop observed at the national level, the same trend was likewise observed in the other French departments (Groupe de travail et al., 2006). In the Somme Department, though an improvement in the declaration of cases could not be excluded, we believe that a recent change in migration trends could better explain the rise, given that the high incidence rates of TB was met in the two to five first years following the arrival in the host country (Lillebaek et al., 2002; Vos et al., 2004; Cain et al., 2008; Lavender et al., 2013). Indeed, the number of foreigners started to rise in 2010 and 2011 (35.7 and 38.6%, respectively), compared to 2009 (25.8%).

People born abroad accounted for 1/3 (33.1%) of the reported cases of TB against 52% at the national level (Valin and Chouaïd, 2012). The migrant population has the highest incidence of TB in France. These data are also found in the literature (García-García et al., 2011; Odone et al., 2011; Gagnière et al., 2011). The reason is because the risk of TB among the migrant population is comparable to their countries of origin. Compared to people born in France, the relative incidence of TB among people born abroad at the national level was very high (Valin and Chouaïd, 2012). Tuberculosis is more frequent among males; the incidence of TB in the Somme Department was higher among men than women and men represented nearly 2/3 (64.6%) of the reported cases from 2007 to 2011. These data were also observed at the national level in the same years [3-4] and in other European countries (Korzeniewska-Koseła, 2013; Cruz-Ferro et al., 2014). One can note that in 2007, the incidence (cases per 10^5 inhabitants) of people aged $\geq$ 65 years was higher than the national one ($12.1/10^5$ versus $8.8/10^5$). In 2009 and 2010, all incidences were lower than the national incidences ($8.2/10^5$ and $8.1/10^5$ respectively). In 2011, the incidence in people aged between 25 and 44 and above 65 ($10.9/10^5$ and $11.8/10^5$ respectively) was higher than what is considered as a « low incidence » of $10/10^5$ inhabitants, according to WHO.

The incidence by age group in the Somme Department is similar to the national incidence for 2007 and 2011 (Che and Antoine, 2011; Valin and Chouaïd, 2012). However, in the Somme Department, the 25-44 age group recorded a steadily increasing incidence for 3 consecutive years (2009-2011). The migration of an active population coming from areas with a high incidence of tuberculosis could explain this trend.

From a public health perspective, the epidemiology of tuberculosis in young children would be a good indicator of how Mycobacterium tuberculosis circulates inside the population, as children would quickly develop the disease after contact and would become seldom contagious. The incidence among children aged less than 5 years old went from $8.6/10^5$ to $0/10^5$ (2007-2009), and from $5.7/10^5$ in 2010 to $8.5/10^5$ in 2011 and was above the departmental one. After the suppression of the Calmette and Guerin's vaccine (BCG), this must be an alarming fact. After considering the data from the Institute de Veille Sanitaire, no case of tubercular meningitis was reported in 2010. However, in the Somme Department, we have recorded two cases in children aged less than 5 years old in 2010. The suspension of the compulsory vaccination should call for special vigilance when monitoring severe forms of child TB. Indeed it is in this age bracket that the risk of pulmonary tuberculosis or tubercular meningitis after infection is high (Erkens et al., 2010). The French Ministry of Health should closely monitor the TB cases in these children in order to review, if necessary, its decision to suspend the BCG. Pulmonary or mixed localizations of TB cases, the most contagious (Madhi et al., 2002; Singh et al., 2005; Gorís-Pereiras et al., 2008) were more frequent in the Somme Department than at the national level (Che and Antoine, 2011; Valin and Chouaïd, 2012).

The main limitation of our work is the fact that it was an observational and retrospective study. However, the study has some relevance. To our knowledge, it is the first study which gives an insight of the precise epidemiology of tuberculosis in the Somme Department, in France. The study covered a period of 5 years and ran before and after the implementation of the National Tuberculosis Plan and in the Somme Department which is an area of an average incidence. This may enable us to evaluate the impact of the NTP in the Somme Department and to extrapolate the results to the national level or to other regions of France.

Conclusion

With a drop in the incidence of TB after the years following the implementation of the National Tuberculosis Program and the suspension of mandatory vaccination with BCG in France, the increase of incidences especially among children under five in the Somme Department clearly indicates that more vigilance is needed to fight in order to avoid an upsurge of TB.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Cain KP, Benoit SR, Winston CA, Mac Kenzie WR (2008). Tuberculosis among foreign-born persons in the United States. JAMA 300:405-412.

https://doi.org/10.1001/jama.300.4.405
Che D, Antoine D (2011) [Epidemiology of tuberculosis in France in 2008]. Médecine et Maladies Infectieuses 41:372–378. https://doi.org/10.1016/j.medmal.2010.12.020
Cruz-Ferro E, Ursúa-Díaz MI, Taboada-Rodríguez JA, Hervada-Vidal X, Anibarro L, Túñez V(2014). Epidemiology of tuberculosis in Galicia, Spain, 16 years after the launch of the Galician tuberculosis programme. The International Journal of Tuberculosis and Lung Disease 18(2):134-140. https://doi.org/10.5588/ijtld.13.0419
Erkens CGM, Kamphorst M, Abubakar I, Bothamley GH, Chemtob D, Haas W, Lange C (2010). Tuberculosis contact investigation in low prevalence countries: A European consensus. https://doi.org/10.1183/09031936.00201609
Gagnière B, Le DGM, Marquis M, Guillois-Bécel Y, Mari C, Le AG, Salomon J (2011). Epidemiology of tuberculosis in French Brittany: cases notified between 2000 and 2007. Medecine et maladies infectieuses 41(1):33-37.https://doi.org/10.1016/j.medmal.2010.04.007
Gorís-Pereiras A, Fernández-Villar A, Chouciño-Garrido N, Otero-Baamonde M, Vázquez-Gallardo R (2008). Factors predicting new tuberculosis infections and tuberculin conversions in a contact tracing system. Enfermeria Clinica 18(4):183-189.
Groupe de travail, Conseil Supérieur d'Hygiène Publique de France (2004-2006). Enquete_autour_d_un_cas_de_tuberculose_Recommandations_pratiques.pdf.https://solidaritessante.gouv.fr/IMG/pdf/Enquete_autour_d_un_cas_de_tuberculose_Recommandations_pratiques.pdf. Accessed 19 Feb 2019.
Hollo V, Zucs P, Ködmön C, Sandgren A, Manissero D (2011). Marking 15 years of efforts towards a comprehensive European TB surveillance system: The epidemiological situation of TB in the EU/EEA in 2009. Eurosurveillance 16(12):19822
Korzeniewska-Kosełа M (2013). Tuberculosis in Poland in 2011. Przeglad epidemiologiczny 67(2):277-281.
Lavender CJ, Globan M, Kelly H, Brown LK, Sievers A, Fyfe JAM, Leslie DE (2013). Epidemiology and control of tuberculosis in Victoria, a low-burden state in south-eastern Australia, 2005–2010. The International Journal of Tuberculosis and Lung Disease 17(6):752-758. https://doi.org/10.5588/ijtld.12.0791
Lillebaek T, Andersen ÅB, Dirksen A, Smith E, Skovgaard LT, Kok-Jensen A (2002). Persistent high incidence of tuberculosis in immigrants in a low-incidence country. Emerging Infectious Diseases 8(7):679. https://doi.org/10.3201/eid0807.010482
Madhi F, Fuhrman C, Monnet I, Atassi K, Poirier C, Housset B, Delacourt C (2002). Transmission of tuberculosis from adults to children in a Paris suburb. Pediatric Pulmonology 34(3):159-163. https://doi.org/10.1002/ppul.10153
Odone A, Riccò M, Morandi M, Borrini BM, Pasquarella C, Signorelli C (2011). Epidemiology of tuberculosis in a low-incidence Italian region with high immigration rates: differences between not Italy-born and Italy-born TB cases. BMC Public Health 11(1):376. https://doi.org/10.1186/1471-2458-11-376
Santé Publique France Tuberculose. https://www.santepubliquefrance.fr/maladies-et-traumatismes/maladies-et-infections-respiratoires/tuberculose/donnees. Accessed 12 Dec 2019
Singh M, Mynak ML, Kumar L, Mathew JL, Jindal SK (2005). Prevalence and risk factors for transmission of infection among children in household contact with adults having pulmonary tuberculosis. Archives of Disease in Childhood 90(6):624-628. https://doi.org/10.1136/adc.2003.044255
Valin N, Chouaïd C (2012) [Tuberculosis in France in 2010: epidemiology, clinical presentation and microbiology]. Revue des Maladies Respiratoires 29:267–276. https://doi.org/10.1016/j.rmr.2011.07.007
Vos AM, Meima A, Verver S, Looman CW, Bos V, Borgdorff MW, Habbema JDF (2004). High incidence of Pulmonary Tuberculosis a decade after immigration, Netherlands. Emerging Infectious Diseases 10(4):736. https://doi.org/10.3201/eid1004.030530
World Health Organization (1972) BCG and vole bacillus vaccines in the prevention of tuberculosis in adolescence and early adult life. Bulletin of the World Health Organization 46:371–385
World Health Organization (2018). Global tuberculosis report 2018. World Health Organization, Geneva