ABSTRACT: Background: In Argentina, approximately 9,000 new cases of tuberculosis (TB) are recorded every year, representing an incidence rate of 22 cases per 100,000 inhabitants. There are no reported studies in Argentina examining the factors that influence the unequal distribution of the disease. The aim of the study was to identify the relationship between the distribution of social and economic factors and TB in Argentina between 2008 and 2012. Method: An ecologic study involving 525 departmental jurisdictions was conducted. Simple linear regression analysis was performed, followed by multiple linear regression for each group of determinants. A final model of determinants of TB’s incidence was constructed from a model of multiple linear regression. Results: The following determinants explain 43% of the variability of TB’s incidence rate among different jurisdictions: overcrowding, proportion of households with a sewage network, proportion of examined patients with respiratory symptoms and proportion of patients who discontinued treatment. Discussion: This study makes an important contribution to a better understanding of the factors influencing the TB occurrence in Argentina, which is the result of a multidimensional and complex process. These factors make part of this disease’s social determination. Conclusion: TB incidence is associated with different determinants, from multiple levels. Inequalities in its distribution in Argentina are driven by the unequal distribution of key social determinants.

Keywords: Tuberculosis. Epidemiology. Socioeconomic factors.
Introduction

There is considerable evidence in the literature that the health status of individuals and populations is often influenced by social factors and by access and use of health services, as well as by factors outside the health sector, including social, economic, political, and environmental1. These factors, which contribute directly to health and disease, as well as their interaction with biological factors, are known as the social determinants of health.

Although tuberculosis (TB) is a preventable and curable disease, it remains a major public health issue worldwide, with 10.4 million new cases happening and 1.3 million deaths every year2. While, globally, the number of people with TB is declining, and the mortality rate has decreased by 47% between 1990 and 20153, disease control strategies remain inadequate2.

In Argentina, approximately 9,000 cases of TB are reported every year. In 2012, 9,070 cases of TB were recorded, with an incidence rate of 22 cases per 100,000 inhabitants. The disease’s distribution is not uniform throughout the country. The difference in disease reporting rates between jurisdictions is noticeable, with some provinces that have significantly higher rates than the national average and others that do not exceed 10 cases per 100,000 inhabitants. Furthermore, localities with a high proportion of the population with unfavorable social determinants remain the most affected by TB4.

There is a consensus in the scientific community that TB is related to the social conditions of life5. Poor conditions affect nutritional status of the population, the likelihood of becoming infected with TB bacillus, and the ability of individuals to respond to infection. Some variables, together with biological factors, are responsible for the relative increase in TB’s incidence4,6,7.
Numerous studies worldwide have addressed the issue of multiple and diverse factors that influence TB occurrence. However, in order to implement fair strategies to reduce inequities and disease incidence, it is important to understand patterns of disease behavior in a territory and its determinants. Some ecologic studies have sought to identify the relationship between the distribution of diseases and socio-economic factors, respecting the different hierarchical levels of these determinants.

A downward trend in reporting new cases has been observed in Argentina; however, this reduction has not helped to reduce inequality in TB distribution. Globally, TB is more common in jurisdictions with high proportions of substandard housing and illiteracy, and the decline in notification rates was lower in areas with greater needs.

Inequality of living conditions and unequal access to health services affect TB occurrence in different ways; therefore, it is important to identify the determinants of the disease in order to develop control strategies that target specific affected groups. However, to the best of our knowledge, there are no published studies in Argentina examining the association between TB incidence, the characteristics of social groups and the geographical areas they live in.

The aim of this work is to identify the social determinants of pulmonary TB and its geographical distribution in Argentina between 2008 and 2012. This analysis aims to contribute to better understand the factors influencing TB occurrence and provides evidence for the development of disease control strategies. It also represents a novel approach to the study of incidence determinants by evaluating the characteristics of access to health services and conditions for disease diagnosis.

**METHOD**

An ecologic study involving 525 departments out of 24 provinces was conducted. The units of analysis were departments in Argentina. Two sources of secondary data were used for this study: the database and mapping data of the National Population and Housing Census (2010) of the National Institute of Statistics and Census (INDEC), from which information on population’s socioeconomic living conditions was obtained; and the registry of the National Institute of Respiratory Diseases (INER Coni) data on the reported cases of pulmonary TB. The data used for the analysis are public and freely available.

This study is based on the Social Epidemiology perspective and models. According to this perspective, the social determination of health states that the ways of getting sick are the result of patterns of production and reproduction determined by social class. Some social determinants are regarded as socioeconomic conditions, measurable through indicators, including employment status, employment type, income, housing characteristics, family nucleus, literacy and food consumption. Three hierarchical levels of socioeconomic indicators’ groups, constituting the independent variables of this study, were defined. The dependent variable was TB incidence rate.
Socioeconomic, cultural, and environmental conditions and TB incidence rate are closely related\textsuperscript{15-17}. Among Level 1 determinants, the Unsatisfied Basic Needs Index (UBNI) was included as a reflection of the population’s development level. The UBNI is a synthetic indicator, comprising social, economic, and health dimensions, and, therefore, may specially represent a population’s life conditions.

Socioeconomic indicators associated with TB and considered markers of living conditions were selected among level 2 determinants. These indicators are (the proportion of households and persons according to) urbanization, illiteracy, unemployment, overcrowding (defined as 3 or more people per bedroom), poor housing, use of solid fuels for cooking, households with drinking water supply, and homes with sewer service.

Finally, Level 3 indicators include markers of access to health services and TB program performance. These are as follows: number of primary health care (PHC) units, proportion of private health coverage, number of laboratories performing smears, proportion of respiratory symptomatic patients evaluated, proportion of TB patients tested, proportion of cases of successful treatment, proportion of patients who discontinued treatment and proportion of patients with directly observed therapy (DOT’s).

An exploratory analysis was performed and thematic maps were obtained in order to visualize the geographical distribution of these indicators. First, the existence of correlation between each independent variable and the dependent variable was evaluated, and then a multiple factor analysis was performed by linear regression. A bivariate analysis was conducted and variables that showed significant levels of correlation ($p < 0.2$) in all levels and those that were deemed essential for the explanatory model were included in the multiple regression analysis. A multiple linear regression (MLR) analysis was performed for all levels, and only variables with evidence of relationship with significant levels ($p < 0.05$) were retained. Finally, a unique MLR was performed, which included all significant variables according to level and all variables associated with a significance of 5% (backward stepwise method). Although the significance level of 5% is accepted as the most appropriate by researchers, the use of 20% in bivariate analysis is recommended in view of the need to include those variables that, although at the level between two variables could be influenced by confounding, they would represent “true” relationships in the multivariate analysis. The statistical exploratory data analysis and maps preparation were performed using the STATA\textsuperscript{\textregistered} 13/SE and the GeoDA\textsuperscript{©} 1.6.7 softwares, respectively.

Regarding this research’s ethical features, the study used non-nominal, secondary data of unrestricted access, thus being dispensed from the evaluation by the Committee of Ethics in Research of the National School of Public Health Sergio Arouca-Oswaldo Cruz Foundation.

**RESULTS**

From the results presented in the maps (Figure 1), it is possible to observe important differences in TB geographical distribution and in socioeconomic determinants.
The highest rates of TB were found in the departments of northern Argentina’s provinces. High rates were also detected in the departments close to Buenos Aires and the southernmost departments of the Patagonian region. Although Buenos Aires Province does not have the greater incidence rate, its suburbs concentrate half of the national cases. In a number of provinces, there was coexistence of departments with high rates and of negligible rates (Figure 1).

SLR analysis revealed a statistically significant association (p < 0.05) between TB incidence rate and UBNI, corresponding to the level 1 variables (Table 1). This means that those departments with a higher proportion of UBNI had a higher TB incidence rate.

SLR analysis showed a statistically significant association (p < 0.2) between TB incidence rate and the following level 2 variables: illiteracy, overcrowding, unemployment, poor housing, use of solid fuel and service of sewage network (Table 1). However, using the MLR model, only the association with overcrowding and the service of sewage network was statistically significant (p < 0.05) (Table 1).

We found statistically significant associations (p < 0.2) between TB incidence and the proportion of respiratory symptomatic patients examined, patients evaluated, treatment success rate, treatment dropout rate, the proportion of patients with DOT, and the proportion of the population with private health coverage. MLR analysis showed significant
associations (p < 0.05) between TB incidence and respiratory symptomatic patients, treatment dropout rate, and proportion of the population with private health coverage (Table 2).

Table 3 shows the results of MLR's final model using all variables found to be significantly associated with TB incidence in the models shown by hierarchical groups. A statistically significant association was found between TB incidence rate and the following variables:

Table 1. Level 1 and 2 socioeconomic factors related to incidence of tuberculosis, department of Argentina, 2008–2012.

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Average</th>
<th>Regression coefficient(^1)</th>
<th>95%CI</th>
<th>p-value</th>
<th>Regression coefficient(^2)</th>
<th>95%CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of households with Unsatisfied Basic Needs Index (UBNI)</td>
<td>12,3</td>
<td>0,828</td>
<td>(0.637 - 1.019)</td>
<td>0.000</td>
<td>0,828</td>
<td>(0.637 - 1.019)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td><strong>Level 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of illiterates</td>
<td>8,4</td>
<td>1,329</td>
<td>(0.801 - 1.856)</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of households with overcrowding</td>
<td>4,9</td>
<td>2,431</td>
<td>(1,993 - 2,870)</td>
<td>0.000</td>
<td>3,010</td>
<td>(2,552 - 3,468)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Proportion of population with unemployment</td>
<td>5,1</td>
<td>0,699</td>
<td>(-0,199 - 1,958)</td>
<td>0.127</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of urban population</td>
<td>75,0</td>
<td>0,019</td>
<td>(-0,074 - 0,112)</td>
<td>0.688</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of substandard housing</td>
<td>7,3</td>
<td>0,612</td>
<td>(0,426 - 0,798)</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of households using solid fuels</td>
<td>7,7</td>
<td>0,295</td>
<td>(0,189 - 0,402)</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of households with drinking water</td>
<td>77,6</td>
<td>-0,037</td>
<td>(-0,122 - 0,046)</td>
<td>0.381</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of households with sewer service</td>
<td>35,7</td>
<td>0,039</td>
<td>(-0,015 - 0,094)</td>
<td>0.160</td>
<td>0,169</td>
<td>(0,117 - 0,221)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

\(^1\)Regression coefficient obtained as a result of univariate models; \(^2\)coefficient obtained as a result of model variables by group; 95%CI: confidence interval of 95%; UBNI.

proportion of overcrowding, proportion of households with waste disposal through a sewage network, proportion of respiratory symptomatic patients examined, and proportion of patients who discontinued treatment. This final model explains 43% of the variability in TB incidence rate among the different departmental jurisdictions of Argentina.

The distribution of TB indicators is rather heterogeneous (Figure 2). While overcrowding is more prevalent in the north of Argentina, poor sanitation occurs more frequently in the south. Abandonment of treatment is more frequent in the north and in the metropolitan

Table 2. Socioeconomic factors at level 3 related to tuberculosis incidence rate, department of Argentina, 2008-2012.

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Average</th>
<th>Regression Coefficient</th>
<th>95% CI</th>
<th>p-value</th>
<th>Regression Coefficient adjusted</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of patients with respiratory symptoms</td>
<td>0.46</td>
<td>14.775</td>
<td>(12.050 – 17.500)</td>
<td>0.000</td>
<td>13.523</td>
<td>(10.965 – 16.081)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>TB Proportion of patients evaluated</td>
<td>58.4</td>
<td>0.127</td>
<td>(0.085 – 0.170)</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of patients with successful TB treatment</td>
<td>57.5</td>
<td>0.130</td>
<td>(0.085 – 0.175)</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of patients TB abandoned treatment</td>
<td>8.5</td>
<td>0.410</td>
<td>(0.295 – 0.526)</td>
<td>0.000</td>
<td>0.379</td>
<td>(0.247 – 0.511)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Proportion of patients with TB TDO</td>
<td>49.5</td>
<td>0.099</td>
<td>(0.058 – 0.140)</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of population with private health coverage</td>
<td>56.6</td>
<td>-30.101</td>
<td>(-41.313 – -18.889)</td>
<td>0.000</td>
<td>-29.632</td>
<td>(-41.949 – -17.316)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Laboratories coverage per 10,000 population.</td>
<td>0.85</td>
<td>-0.869</td>
<td>(-3.543 – 1.844)</td>
<td>0.523</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APS coverage per 10,000 population.</td>
<td>1.1</td>
<td>-0.157</td>
<td>(-1.252 – 0.937)</td>
<td>0.778</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1Regression coefficient obtained as a result of univariate models; 2coefficient obtained as a result of model variables by group; 95%CI: confidence interval of 95%; TB: tuberculosis; directly observed therapy (DOT); primary health care (PHC). Source: Reported cases of pulmonary TB 2008-2010 PNCTB. National Census of Population and Housing, INDEC, 2010.
area of Buenos Aires. Finally, respiratory symptoms are more frequently observed in both the north and the south of Argentina.

**DISCUSSION**

This study found that TB incidence is associated with the proportion of the population subject to overcrowding, the proportion of households with a waste disposal through sewage network, the proportion of respiratory symptomatic patients examined, and the proportion of patients who discontinued treatment.

This study’s results indicate that areas with low socioeconomic status have higher levels of disease incidence. The association between variables indicative of poverty and TB

Table 3. Socioeconomic factors related to tuberculosis incidence rate, department of Argentina, 2008-2012. Final model (level 1, 2, and 3).

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Average</th>
<th>Regression Coefficient</th>
<th>95%CI</th>
<th>p-value</th>
<th>Regression Coefficient adjusted</th>
<th>95%CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion households with UBNI</td>
<td>12,3</td>
<td>0,828</td>
<td>(0,637 – 1,019)</td>
<td>0,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of households with overcrowding</td>
<td>4,9</td>
<td>3,010</td>
<td>(2,552 – 3,468)</td>
<td>0,000</td>
<td>2,372</td>
<td>(1,875 – 2,869)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Proportion of households with sewer service</td>
<td>35,7</td>
<td>0,169</td>
<td>(0,117 – 0,221)</td>
<td>0,160</td>
<td>0,091</td>
<td>(0,031 – 0,151)</td>
<td>0,003</td>
</tr>
<tr>
<td>Proportion of patients with respiratory symptoms</td>
<td>0,46</td>
<td>13,523</td>
<td>(10,965 – 16,081)</td>
<td>0,000</td>
<td>10,611</td>
<td>(8,114 – 13,108)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>TB proportion of patients who left treatment</td>
<td>8,5</td>
<td>0,379</td>
<td>(0,247 – 0,511)</td>
<td>0,000</td>
<td>0,363</td>
<td>(0,242 – 0,484)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Proportion of population with private health coverage</td>
<td>56,6</td>
<td>-29,632</td>
<td>(-41,949 – -17,316)</td>
<td>0,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1Regression coefficient obtained as a result of multivariate models groups of variables; 2regression coefficient obtained as a result of the model made with the variables that were significant in the models by groups of variables; 95%CI: confidence interval of 95%; UBNI: Unsatisfied Basic Needs Index; TB: tuberculosis.

incidence is widely documented\textsuperscript{6,12,16}. A study conducted by Bossio et al. in Argentina found an association between increased prevalence, TB incidence and poor social and economic conditions\textsuperscript{12}. Our study corroborates these findings, showing an association between the proportion of households with UBNI and TB incidence in the univariate model. In Argentina, this variable is considered an indicator of the households’ socioeconomic status, allowing for the definition of groups according to structural poverty, a more complex notion of poverty, which goes beyond insufficient income\textsuperscript{18}. However, this association was not statistically significant in the MLR model. This may happen due to inherent limitations of this socioeconomic indicator’s composition\textsuperscript{19}.

Other variables related to socioeconomic status (particularly relevant to Level 2 of the selected variables) remained significant in the final regression model. An example is the proportion of households with overcrowding, which is one of the UBNI components. This study

A: Proportion of poor sanitation; B: proportion of overcrowding; C: proportion of abandonment of treatment; D: proportion of presence of respiratory symptoms.

Figure 2. Map of the proportion of tuberculosis indicators, Argentina, 2008–2010.
corroborates existing research showing a significant association between the occurrence of pulmonary TB and overcrowding\textsuperscript{20,21}. This may be explained by the fact that the association between overcrowding and TB incidence is stronger than the relationship between its incidence and the variable proportion of households with UBNI, thus leaving it displaced in the final model. This association may be explained in terms of the disease’s mode of transmission\textsuperscript{22}. TB is transmitted by air and overcrowding facilitates greater transmission. This risk can increase among people living in adverse socioeconomic conditions where the possibilities of adequate ventilation are reduced. Souza et al.\textsuperscript{23} conducted a study in the city of Olinda, Brazil, constructing an index of social deprivation. This included the "average number of people per bedroom", a factor strongly related to TB transmission. The authors concluded that there was a strong association between social deprivation and TB emergence, highlighting the priority groups and areas requiring intervention. In a literature review, Lönnroth et al. suggested that overcrowding was associated with a high risk of TB transmission\textsuperscript{7}. The evidence indicates that this association is influenced by other factors linked to housing conditions and to the characteristics of individuals, such as malnutrition and socioeconomic disadvantages\textsuperscript{22}.

In line with the above, this study also found an association between TB incidence and a higher proportion of households with a waste disposal system through a sewage network. This service is considered an indicator of the structural conditions of life, according to the INDEC linked to the urban development of health and sanitation. This study also supports another research performed in Argentina, examining factors associated with adherence to TB treatment\textsuperscript{24,25}. It appears that the availability of basic services is a determinant key of health and of health outcomes among patients of low socioeconomic status. Furthermore, patients who do not adhere to treatment also have poorer indicators of housing conditions, such as the type of sewage system and overcrowding. A possible explanation may be that in locations lacking a sewage service, there is also less access to health services and, consequently, TB diagnosis is less likely. In a study on the determinants of TB incidence and social inequalities in Latin America, researchers found that access to drinking water and sanitation was significantly associated with TB incidence rates, and that these higher incidence rates are disproportionately concentrated in the most socially disadvantaged countries\textsuperscript{26}.

The association between socioeconomic status and poor access to health services for TB diagnosis has been examined in numerous studies conducted in different countries and regions, using different methodologies and indicators. Hanif et al.\textsuperscript{27} evaluated factors influencing adherence to antiretroviral treatment and concluded that socioeconomic factors were often a proxy for other barriers, such as the cost of transportation, lack of time, difficulties in obtaining information, and discrimination\textsuperscript{27}. A study conducted in the Dominican Republic\textsuperscript{28} showed that the poorest patients experienced the greatest economic impact and identified the main direct and indirect costs as follows: necessary expenses for supplementary food during treatment, transportation costs to attend health services, loss of income due to the interruption of the working day, and loss of time incurred to attend health services and as a result of delays in care\textsuperscript{28}. The authors concluded that diagnosis and free treatment of TB were not sufficient to mitigate the financial constraints faced by vulnerable groups as a result of the disease.
Evidence indicates that individual characteristics of patients, such as socio-demographic characteristics, level of education and employment status influence the individual’s health but also the access to health services for diagnosis and treatment. In our study, we did not detect an association between unemployment, illiteracy and TB incidence, maybe it could be due to poor statistical power. Despite this, these features reflect greater socioeconomic vulnerability and low level of education is directly related to the lack of information and the inadequate identification of the disease\textsuperscript{12,29}, thus prolonging the time between onset of symptoms and health center attendance and furthering disease transmission.

Inequalities in TB distribution are driven by the unequal distribution of key social determinants, such as income level, level of education, nutritional status, adequate housing, environmental conditions and access to employment\textsuperscript{4,30}. In turn, these unequal social conditions facilitate TB transmission in the community\textsuperscript{4,31}. TB appears to be a disease of large urban centers\textsuperscript{32}, although our study did not identify this association. This may be due to the fact that TB patients living in rural areas have difficulties in travelling to health centers for diagnosis, treatment, and follow up, thereby increasing the disease transmission. Moreover, the results of our study show that TB incidence was significantly associated with the proportion of patients who discontinued treatment. Discontinuation of treatment increases the likelihood of failure to cure the disease and also increases the chance of relapses. Furthermore, cessation of treatment is one of the main factors associated with the continuous transmission of the disease in the community. Studies have also found that approximately half of patients with a previous abandonment of TB treatment are more likely to be non-adherent, which increases the risk further for development and transmission of multidrug-resistant strains\textsuperscript{33-35}.

Several studies, including a research conducted in Argentina, have shown that the probability of abandoning treatment is related to unfavorable socioeconomic indicators\textsuperscript{29}. Our study found that the population with the greatest risk of disease incidence was also affected by an unfavorable economic situation. These findings are therefore particularly relevant to the issue of disease control. Our results indicate that the incidence of pulmonary TB is higher in those departments with a higher proportion of respiratory symptoms. Of course, health teams working in departments where TB prevalence is higher are already sensitized to this issue and, therefore, the search for new TB cases is conducted with greater care and more efficiently. Conversely, the assessment of respiratory symptoms is not adequate in departments where the incidence of TB is negligible.

Finally, this study has some limitations that must be mentioned. First, we analyzed the reporting of cases, and not the incidence of the disease. It is postulated that underreporting of cases, which occurs in Argentina and worldwide, affects the most vulnerable groups of the population. This is due to several factors, including barriers to access to health services for diagnosis. The effect is an underestimation of the association of determinants in the disease’s development, which negatively influences the study’s results. One can argue the presence of an ecological fallacy, but we do not intend to make inferences at the individual level and thus do not become a problem.
Despite these limitations, this study makes an important contribution to a better understanding of the factors influencing the occurrence of tuberculosis in Argentina, which is crucial for developing strategies aimed at decreasing the disease’s incidence.

CONCLUSIONS

We conclude that in Argentina, inequalities in TB distribution are driven by the unequal distribution of key social determinants. What is more, TB incidence is associated with social conditions like overcrowding, sewage network and with surveillance performance, like respiratory symptomatic examination and non-compliance TB treatment. To our knowledge, this is the first study in Argentina to analyze socioeconomic factors associated with the incidence of TB. The key contribution of this study is the evaluation of TB’s unequal social distribution in Argentina, its associated social determinants, and, particularly, barriers to health services access, the assessment of the disease’s diagnosis as one of the levels influencing TB occurrence. These findings support the development of strategies for disease prevention, diagnosis, and control.

ACKNOWLEDGEMENTS

We thank the National Institute of Respiratory Diseases “Emilio Coni” for providing data that made this study possible. The authors also thank Nicole Breanne Lesnar for the invaluable support in translating the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable for this study.

REFERENCES


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Authors’ contributions: We have participated in the study and concur with the submission and subsequent revisions of the manuscript. Fernando Andrés Hilal: Participation in protocol design and data analysis; primary responsibility for manuscript preparation. María Belén Herrero: Participation in the protocol design’s review and manuscript preparation and writing. Elvira Maria Godinho de Seixas Maciel: Primary responsibility for the final protocol design’s review and manuscript writing. Jose Ueleres Braga: Participation in protocol design, data analysis, and manuscript writing; primary responsibility for the manuscript’s final review.