



Tuberculosis: A Problem Yet to Be Solved

Yisel de la Caridad Ramos-Aguila¹ , Andrés Villar-Bahamonde¹ , Miriam Caridad Luis-Martínez¹ , Yamile Hernández-Ramos¹ , Martha Beatriz Cuello-Carballo² ,
Dámaso Díaz-Mató¹ 

¹University of Medical Sciences of Pinar del Río. Provincial Center of Hygiene, Epidemiology and Microbiology. Pinar del Río, Cuba.

²University of Medical Sciences of Pinar del Río. Pinar del Río, Cuba.

ABSTRACT

Introduction: tuberculosis is a bacterial disease that attacks the lungs, and its incidence has increased in recent years.

Objective: to characterize the incidence of tuberculosis in Pinar del Río during the period 2015 to 2023.

Methods: a descriptive, cross-sectional study was conducted in a universe consisting of 250 patients diagnosed with tuberculosis between 2015 and 2023. Statistical records from the Department of Medical Records and Health Statistics were reviewed to obtain information. Statistical analysis was performed using the EPIDATA 3.0 program, employing absolute and relative frequencies, as well as incidence rates per 100,000 inhabitants.

Results: a trend toward increased incidence of tuberculosis was reported. Male sex represented more than 75 % of the reported cases. More than 40 % of cases occurred in the group aged 65 years and older in 2015, 2022, and 2016. More than 80 % of cases were pulmonary. Smoking accounted for 56 % in 2016 and 2019. Age 60 years and older represented 50,0 % in 2022 and 44,0 % in 2016. In 2023, 27,9 % had a history of being institutionalized in closed facilities, and 25 % were alcoholics in 2020.

Conclusions: tuberculosis in Pinar del Río has shown a trend toward increase, with a decline during the pandemic years. Male sex and older adults were identified as the main epidemiological groups to be considered.

Keywords: Epidemiology, Descriptive; Risk Factors; Incidence; Tuberculosis.

Citación: Ramos-Aguila Y de la C, Villar-Bahamonde A, Luis-Martínez MC, Hernández-Ramos Y, Cuello-Carballo MB, Díaz Mató D. La tuberculosis un problema por resolver. Rev Ciencias Médicas [Internet]. 2026 [citado Fecha de acceso]; 30(2026): e6669. Disponible en: <https://revcmpinar.sld.cu/index.php/publicaciones/article/view/6669>

Enviado: 05 de febrero de 2026

Aceptado: 26 de mayo de 2026

Publicado: 30 de junio del 2026

INTRODUCTION

Since the 1980s, the world has been witnessing the emergence of new infections such as HIV/AIDS, and the reappearance of infectious diseases that represent a growing threat to the hegemony of biomedicine, such as tuberculosis (TB), malaria, and syphilis.⁽¹⁾ TB is a bacterial disease that attacks the lungs, as well as other parts of the body, including the kidneys, the spine, and the brain. Not all infected people manifest the disease, with two types of conditions existing: latent infection and active TB.⁽²⁾

The symptoms of TB depend on the location of the infection; when the infection is located in the lungs, symptoms include a severe cough that lasts 3 weeks or more, chest pain, cough with blood or sputum; in addition, other symptoms may exist such as weakness or fatigue, weight loss, lack of appetite, chills, fever, and night sweats.⁽³⁾

TB remains the deadliest contagious disease in the world. The sick patient can transmit the microbes to others through the air when a person with the contagious disease in the lung or throat coughs, speaks, or sings. Among the people at greatest risk of becoming ill are those who have contact with someone with the disease, people born in or who visit places, health workers, and other people who work or live in places with a high risk of transmission, such as homeless shelters, prisons, and nursing homes.⁽⁴⁾

In most infected people, the infection is contained by the immune system, with the bacteria enclosed in caseous granulomas or tubercles. In approximately 5 % of infected cases, rapid progression to TB will occur within the first two years after infection. About 10 % of people with latent infection will reactivate, half during the first year and the rest throughout their lives, mainly due to reactivation of dormant tuberculosis bacilli acquired by primary infection or, less frequently, by reinfection.⁽⁵⁾

The notification of cases of infectious diseases has been and continues to be a critical step to control and prevent the spread of communicable diseases. Case reporting is essential for routine surveillance and for determining the burden of disease in the community. In addition, it serves to detect the source of infection and outbreaks, helps establish the appropriateness of the diagnosis and recommended treatment regimens, and is essential for the planning, implementation, and evaluation of care and prevention programs.⁽⁶⁾

The *Mycobacterium tuberculosis* complex comprises a group of pathogenic bacteria that cause TB disease in humans and other mammals. It has about 4,000 genes, of which the function of less than half is known. Of the forms that affect humans, there are nine main families that diverged from a common ancestor and diversified in different regions of the world. It is estimated that a quarter of the world's population is infected with the TB bacillus without developing the disease.⁽⁷⁾

During the COVID-19 pandemic, techniques related to genomic epidemiology, which combines classical epidemiology with whole-genome sequencing, became especially relevant. They can be applied both for diagnosis and for surveillance of infectious diseases, with results that complement conventional approaches, allowing identification of transmission pathways with greater precision.⁽⁸⁾

In 2018, an estimated 10 million TB cases occurred worldwide, and 1,5 million people died from the disease, including 251,000 people with human immunodeficiency virus (HIV) coinfection. In the Region of the Americas, an estimated 289,000 cases occurred in 2018, while estimated deaths for the same year were 22,900, of which 26 % corresponded to people with TB/HIV coinfection. It should be highlighted how this disease is greatly influenced by social and economic determinants, as well as specific health risk factors. ⁽⁹⁾

In November 2017, more than seventy Ministers of Health and nearly fifty high-level national representatives approved the Moscow Declaration to end TB. In May 2018, the World Health Assembly adopted the 13th WHO General Programme of Work 2019-2023 and approved a resolution that includes commitments aimed at acting faster to end the disease. ⁽¹⁰⁾

At the high-level meeting of the United Nations General Assembly on TB in 2023, the commitments and goals of 2018 were reaffirmed, and new goals were established for the period 2023-2027. These include: reaching 90 % of people who need prevention and care services; using a WHO-recommended rapid test as the first method to diagnose it; offering a package of social and health benefits to all people with TB; guaranteeing the availability of at least one new safe and effective vaccine against it; and closing funding gaps for the implementation of measures and research on it by 2027. ⁽¹¹⁾

In Cuba in 2023, 755 TB cases were registered and the risk of becoming ill was $7,4 \times 100,000$ inhabitants; 50 people died and the risk of dying from this cause was $0,5 \times 100,000$ inhabitants. In Pinar del Río, 44 cases were reported and the risk of becoming ill was $8,2 \times 100,000$ inhabitants.⁽¹²⁾ Since 2021, an increase in the incidence of the disease has been observed, a situation similar to that reported internationally in the last 3 years.

Taking the above into account, we considered it appropriate to carry out the following research with the objective of characterizing the incidence of TB according to sociodemographic variables, location, and risk factors of the cases diagnosed in Pinar del Río province during the years 2015 to 2023.

METHODS

A descriptive, cross-sectional study was conducted with the objective of characterizing the incidence of TB according to sociodemographic variables, location, and risk factors of the cases diagnosed in Pinar del Río province during the years 2015 to 2023.

The study universe consisted of 251 patients diagnosed with TB in Pinar del Río province in the period from January 2015 to December 2023. The variables taken into account were: TB incidence, age, sex, location of the disease, and risk factors.

To obtain the information, theoretical methods of documentary analysis were taken into account, the review of statistical records from the Department of Medical Records and Health Statistics of the Provincial Center of Hygiene, Epidemiology and Microbiology of Pinar del Río, Notifiable Diseases Case Notification (form 84-011), statistical week registry (form 241-403-02), in addition to the epidemiological history of the notified cases filed in the provincial epidemiology department.

Data were represented in tables and graphs using the Microsoft Office 2016 package. Statistical analysis was performed using the EPIDATA 3.0 program; absolute and relative frequencies were used, as well as incidence rates calculated per 100,000 inhabitants. The research adhered to ethical precepts. No experimental maneuvers were applied, and the information was processed confidentially and without the presentation of data that could affect the integrity of patients. The study complied with the II Declaration of Helsinki and with current legislation in Cuba. Under no circumstances will the identity of patients be revealed. The results will only be published for the scientific community.

RESULTS

The incidence of TB in Pinar del Río in the years 2015 to 2023 is represented in Figure 1. This is confirmed in the graph through the representation of the annual rates of the disease and the trend calculated without considering the values of the COVID-19 years, representing in these the point estimate of the rate according to said trend. TB in Pinar del Río has shown a general upward trend during the period 2015 to 2023, with the highest risk of becoming ill in the years 2018 and 2023.

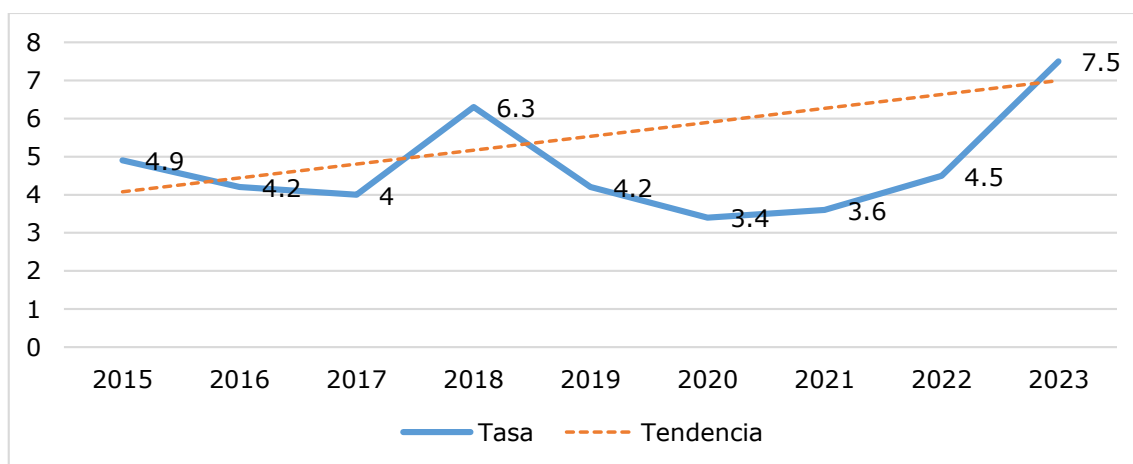


Fig. 1 Incidence of tuberculosis. Pinar del Río 2015-2023.

The percentage distribution of TB cases according to sex in the years 2015 to 2023 is shown in Figure 2. Male sex represented more than 75 % of the notified cases in each year, from 2015 to 2023, except in 2021, when it represented 61,9 %.

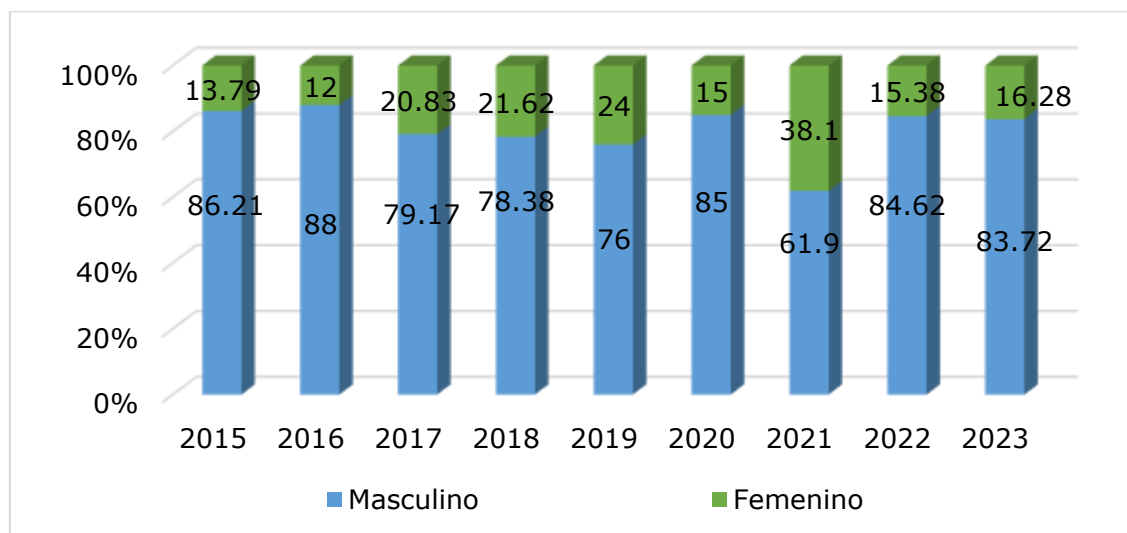


Fig. 2 Percentage distribution of tuberculosis according to sex, Pinar del Río 2015-2023.

In Pinar del Río, more than 40 percent of the reported cases of tuberculosis according to age groups in the years 2015, 2022, and 2016 occurred in the group aged 65 years and older; in the latter year, the 20 to 29 age group also represented a high percentage, 44 %; in the years 2017, 2018, and 2020, the highest percentage of cases was found in the 40 to 49 age group, and in 2023, the highest percentage was recorded in the 50 to 59 age group.

The percentage distribution of tuberculosis according to location in the years 2015 to 2023 is shown in Figure 3.

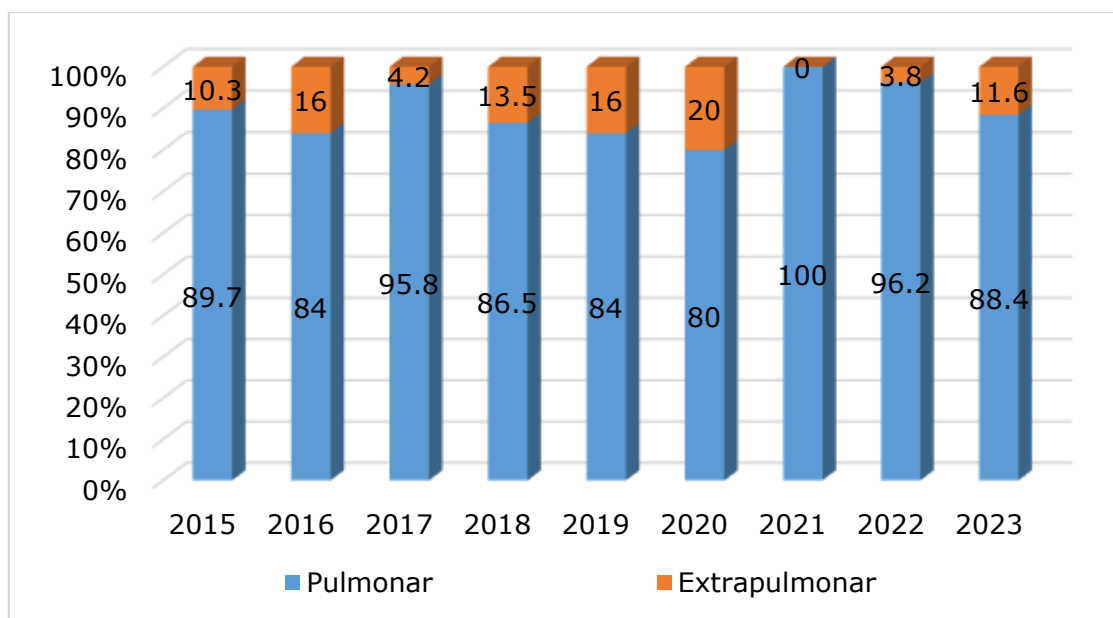


Fig. 3 Percentage distribution of tuberculosis according to location, Pinar del Río 2015-2023.

The pulmonary form predominated in more than 80 percent of the cases diagnosed in all years; in 2021 it represented 100 %, and in the years 2022 and 2017 the percentages were also high, 96,2 % and 95,8 % respectively.

Regarding risk factors in patients diagnosed with tuberculosis in the years 2015 to 2023, it was found that smoking proved to be a risk factor with high percentages in the years 2016 and 2019 (56 %) respectively, 55 % in 2020, 38,5 % in 2022, 29,2 % in 2017, and 25,6 % in 2023; age 60 years and older showed high percentages in the years 2022 (50,0%), 2016 (44,0%), 2015 (41,4 %), 2017 (29,2 %), 2021 (23,8 %), and 2023 (23,3 %). A history of being under an institutionalization regime also constituted a risk factor for the disease, with high percentages in 2023 (27,9 %) and 2020 (20 %); as for alcoholism as a risk factor, it also showed high percentages in 2020 (25 %) and 2017 (20,8 %).

DISCUSSION

In Cuba, there is a Prevention and Control Program, which has allowed satisfactory results in the control of tuberculosis, where the work carried out by family physicians and nurses plays a fundamental role, as they carry out active search for new cases in the communities where they work and ensure compliance with the therapeutic regimen. However, in the pandemic years (2019-2022) in Pinar del Río, as in the rest of the country, health care was highly focused on COVID-19, with high degrees of demand for care for the disease, without ceasing to provide services for other diseases requiring health care. The economic difficulties faced in the country after COVID-19, the intensification of the economic blockade, and its impact on the most vulnerable population sectors could be factors that contributed to the behavior in the incidence of the number of cases observed in the period in the territory.

According to the WHO, tuberculosis is spreading again worldwide for the first time in 20 years due to COVID-19 and lockdowns, which limited detection tests and access to treatment; the incidence of the disease increased worldwide except in Africa, where it is feared that the figures do not reflect reality due to the disruptions suffered by health services due to the coronavirus pandemic. This coincides with the result of this research.⁽¹³⁾

It is stated that before the COVID-19 pandemic, many countries were achieving solid progress in the fight against tuberculosis; however, the COVID-19 pandemic and socioeconomic inequalities have reversed years of progress in the fight against tuberculosis and have increased the burden on those affected, especially the most vulnerable.⁽¹⁴⁾

On the other hand, the literature points out that due to the continuous difficulties encountered in providing and accessing basic tuberculosis services, many cases have not been diagnosed or treated. The number of new cases went from 7,1 million cases in 2019 to 5,8 million in 2020. Although 6,4 million cases were diagnosed in 2021, this is still well below pre-pandemic levels.⁽¹⁵⁾

In a study conducted in Cuba at the Pedro Kourí Institute of Tropical Medicine, by the Department of Epidemiology, PAHO/WHO Collaborating Center for the elimination of Tuberculosis, a reduction in tuberculosis notification was shown in 2020-2021 to 4,9 (544 cases as annual average), stating that, as has occurred in other regions and in the world with the interruption in tuberculosis services due to the impact of COVID-19, the processes of case location and detection decreased sharply in 2020-2021 compared to previous years. This justifies the increase in the diagnostic gap at the end of the period, requiring the observed decrease to be interpreted differently.⁽¹⁶⁾

Regarding the results obtained with respect to sex, men show social behaviors that on many occasions predispose them to the disease, such as alcohol or tobacco consumption and the level of institutionalization due to inadequate social behaviors.

Several studies coincide with the results referring to the predominance of tuberculosis in the male sex; in Costa Rica during 2021, 353 cases of Tuberculosis were registered, two out of every three registered cases corresponded to men.⁽¹⁷⁾ In a study conducted in Lima, Peru in the years 2019 and 2020, the male sex and the 18 to 29 age group predominated; the predominant location was pulmonary.⁽¹⁸⁾

In a study conducted in Santiago de Cuba at the "Vladimir Ilich Lenin" General University Hospital from 2020 to 2021, it was found that 56,76 % of patients diagnosed with tuberculosis were between 45 and 69 years of age, 64,86 % were male, and pulmonary tuberculosis with positive smear microscopy predominated (64,86 %) as the form of presentation,⁽¹⁹⁾ coinciding with the results of this research.

With respect to age, considered a risk factor for the development of the disease, we found a predominance of the age group of 60 years and older, which could correspond to the physiological immunosuppression that occurs at extreme ages of life, the increased incidence and prevalence of chronic diseases in older adults, and long-term exposure to other risk factors such as smoking and alcoholism.

In work presented in Mexico regarding the risk factors identified in tuberculosis patients, smoking was related to a 2-3 times risk of suffering tuberculosis, and it was found as a risk factor for patients who developed extrapulmonary tuberculosis in 30 %; alcoholism in patients with pulmonary tuberculosis was 35 % and 30 % in the extrapulmonary form; in addition, the predominance of the male sex was shown in both locations. This coincides with the results found in this research, not corresponding with the results referring to the association with HIV-AIDS, where 25 % of cases were infected, and diabetes mellitus, where 28 % of patients with pulmonary tuberculosis and 17 % of the extrapulmonary form.⁽²⁰⁾ These being higher than the results found in this research.

Regarding cases notified under closed-regime institutionalization, this also constituted a risk factor that showed high percentages, reflecting the existence of factors such as overcrowding, prolonged periods of institutionalization, and therefore a greater risk of becoming infected.

CONCLUSIONS

It is concluded that tuberculosis in Pinar del Río has had an upward trend in the last nine years, showing a decline in the pandemic years, which brought with it effects on the tuberculosis prevention and control program; the male sex represented more than two thirds of the patients diagnosed every year, especially in older adults; the most frequent form of location was pulmonary, and the presence of multiple risk factors, such as smoking and alcoholism, plays an important role in it.

BIBLIOGRAPHIC REFERENCES

1. Arrizabalaga J. El desafío de las enfermedades (re)emergentes, los límites de la respuesta biomédica y el nuevo paradigma de salud global. *História, Ciências, Saúde-Manguinhos*. [Internet]. 2021. [Consultado 23/05/2024]; 28(1): 255-281. Disponible en: <https://doi.org/10.1590/S0104-59702021000100013>
2. MedlinePlus en español [Internet]. Bethesda (MD): Biblioteca Nacional de Medicina (EE.UU.); 2021 [Consultado 23/05/2024]. Disponible en: <https://medlineplus.gov/spanish/tuberculosis.html>
3. Centros de Control y Prevención de Enfermedades CDC en español [Internet]. Estados Unidos: Division of Tuberculosis Elimination (EE. UU.); 2022 [Consultado 23/05/2024]. Disponible en: <https://www.cdc.gov/tuberculosis/esp/topic/basics/signsandsymptoms.htm>
4. Centros de Control y Prevención de Enfermedades CDC en español [Internet]. Estados Unidos: Division of Tuberculosis Elimination (EE. UU.); 2021 [Consultado 23/05/2024]. Disponible en: <https://www.cdc.gov/tuberculosis/esp/publications/faqs/default.htm>
5. Vines Sornoza TP, Acosta Castro FE, Zambrano Cerón DG, Pinargote Tello LM. Riesgos y consecuencias de los pacientes diagnosticados con tuberculosis pulmonar. *RECIMUNDO*. [Internet]. 30 Jul 2021. [Consultado 27/05/2024]; 5(3):257-6. Disponible en: <https://recimundo.com/index.php/es/article/view/1259>
6. Conde Sampayo A, Ursúa Díaz MI, Cruz Ferro E, Taboada Rodríguez JA, Hervada Vidal X. Comparativa de las características de los casos de tuberculosis detectados por las unidades de tuberculosis por búsqueda activa y los declarados de forma pasiva por los profesionales sanitarios. *Galicia 2014-2018. Rev. esp. salud pública*. [Internet]. 2020. [Consultado 27/05/2024]; 94. Disponible en: <https://pmc.ncbi.nlm.nih.gov/articles/PMC11583154/>
7. Chiner-Oms Á, López MG, Moreno-Molina M, Furió V, Comas I. Gene evolutionary trajectories in *M. tuberculosis* reveal temporal signs of selection. *Proceedings of the National Academy of Sciences*. [Internet]. 2022. [Consultado 28/05/2024]; Disponible en: <https://doi.org/10.1073/pnas.2113600119>
8. Cancino-Muñoz I, López M, Torres-Puente M, Comas I. Valencia Region Tuberculosis Working Group. Population-based sequencing of *Mycobacterium tuberculosis* reveals how current population dynamics are shaped by past epidemics. *eLife*. [Internet]; 2022 [Consultado 28/05/2024]. Disponible en: <https://elifesciences.org/articles/76605>

9. Bernal O, López R, Montoro E, Avedillo P, Westby K, Ghidinelli M. Determinantes sociales y meta de tuberculosis en los Objetivos de Desarrollo Sostenible en las Américas. *Rev panamericana salud pública* [Internet]. 2020 [Consultado 28/05/2024]; 44: 153. Disponible en: <https://doi.org/10.26633/RPSP.2020.153>
10. OPS. United States of America: Washington, D.C[Internet]; 2020 [Consultado 28/05/2024]. Disponible en: <https://doi.org/10.37774/9789275321331>
11. Organización Mundial de la Salud. Ginebra: OMS[Internet]; 2023. [Consultado 28/05/2024]. Disponible en: <https://www.who.int/es/news/item/07-11-2023-tuberculosis-response-recovering-from-pandemic-but--accelerated-efforts-needed-to-meet-new-targets>
12. Dirección de Registros Médicos y Estadísticas de Salud. Anuario estadístico 2023. [Internet]. Edición 51. La Habana: Dirección de Registros Médicos y Estadísticas de Salud; 2023. [Consultado 28/05/2024]. Disponible en: <https://temas.sld.cu/estadisticassalud/>
13. DW Global Media Forum [Internet]. Alemania: DW; 2022. [Consultado 28/05/2024]. Disponible en: <https://www.dw.com/es/oms-advierte-que-la-tuberculosis-vuelve-a-propagarse-por-el-mundo/a-63580828>
14. Organización Mundial de la Salud [Internet]. Ginebra: OMS; 2020. [Consultado 28/05/2024]. Disponible en: <https://www.who.int/es/news/item/14-10-2020-who-global-tuberculosis-progress-at-risk>
15. Organización Panamericana de la Salud [Internet]. Estados Unidos: OPS; 2022 [Consultado 28/05/2024]. Disponible en: <https://www.paho.org/es/noticias/27-10-2022-aumenta-morbimortalidad-por-tuberculosis-durante-pandemia-covid-19>
16. González Díaz, A; Martínez Rodríguez, A; Rodríguez, YA; González Ochoa, ER. Tuberculosis en Cuba, 2015-2021: avances en el camino hacia las metas de eliminación. *Rev Med Tropical*. [Internet]. 2023. [Consultado 28/05/2024]; 75(1). Disponible en: <https://revmedtropical.sld.cu/index.php/medtropical/article/view/922>
17. Organización Panamericana de la Salud [Internet]. Estados Unidos: OPS; 2022 [Consultado 28/05/2024]. Disponible en: <https://www.paho.org/es/noticias/24-3-2022-tuberculosis-es-mas-frecuente-hombres-costa-rica>
18. Calixto EF, Pantoja SLR. Características y frecuencia de tuberculosis antes y durante la pandemia por COVID-19 en adultos atendidos en un centro de atención primaria, Lima-Perú, 2019-2020. *Horiz. Med.* [Internet]. 2023. [Consultado 28/05/2024]; 23(1): 2146. Disponible en: http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S1727-558X2023000100006&lng=es
19. Pérez Domínguez Y, Ojeda González YG, Garib Hernández R. Comportamiento clínico-epidemiológico de la tuberculosis pulmonar en el Hospital Vladimir Ilich Lenin, 2020-2022. *Rev Coc Med.* [Internet]. 2024. [Consultado 28/05/2024]; 28. Disponible en: <https://revcocmed.sld.cu/index.php/cocmed/article/view/4704>

20. Hernández-Solís A, Navarro-Reynoso F, Reding-Bernal A. Factores de riesgo en pacientes con tuberculosis pulmonar y extrapulmonar en un hospital de concentración de la Ciudad de México. Salud pública Méx. [Internet]. 2020. [Consultado 28/05/2024]; 62(4): 452-452. Disponible en: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0036-36342020000400452&lng=es