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LITERATURE REVIEW

HEALTH INDICATORS USED FOR SITUATIONAL DIAGNOSIS IN TUBERCULOSIS: AN INTEGRATIVE REVIEW

INDICADORES DE SAÚDE UTILIZADOS PARA O DIAGNÓSTICO SITUACIONAL EM TUBERCULOSE: UMA REVISÃO INTEGRATIVA

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Abstract
Background: The use of health indicators allows the assessment of the extent and magnitude of a characteristic or occurrence of a problem in each population. **Objective:** To analyze the health indicators used to perform the situational diagnosis of tuberculosis (TB) according to national and international literature. **Methods:** An integrative review performed through the question "How have health indicators been used to make the situational diagnosis of TB?" elaborated on the PICo strategy in the LILACS, MEDLINE and EMBASE databases. It was considered as criteria, primary studies with complete texts published in Portuguese, English, and Spanish, and to answer the guiding question. **Results:** Of the 39 articles selected, health indicators were categorized in epidemiological, operational dimensions, management, quality of health services and programs, inputs, and medicines logistics, socioeconomic and demographic, access to health services, and registration and surveillance systems. **Conclusions:** The use of this indicators contributes to monitoring the effectiveness of TB coping and controlling actions.

Key words: Tuberculosis; Outcome Assessment, Health Care; Diagnosis of Health Situation; Health Status Indicators; Management Indicators.

Resumo
Introdução: A utilização dos indicadores de saúde permite a avaliação da extensão e magnitude de uma característica ou ocorrência de um agravo em uma determinada população. **Objetivo:** Analisar os indicadores de saúde utilizados para realizar o diagnóstico situacional da tuberculose (TB), de acordo com a literatura nacional e internacional. **Método:** Revisão integrativa realizada por meio da pergunta "Como os indicadores de saúde têm sido utilizados para realizar o diagnóstico situacional da TB?", elaborada a partir da estratégia PICo nas bases de dados LILACS, MEDLINE e EMBASE. Considerou-se como critérios, os estudos primários com textos completos publicados nos

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idiomas português, inglês e espanhol, e que respondessem à questão norteadora. **Resultados:** Dos 39 artigos selecionados, os indicadores de saúde foram categorizados em dimensões: epidemiológica, operacional, gestão, qualidade das ações, serviços e programas de saúde, logístico de insumos e medicamentos, socioeconômicos e demográficos, acesso aos serviços de saúde, e sistemas de registro e vigilância. **Conclusão:** A utilização destes indicadores contribui para o monitoramento quanto a efetividade das ações de enfrentamento e controle da TB.

Palavras-chave: Tuberculose; Avaliação de Resultados em Cuidados de Saúde; Diagnóstico da Situação de Saúde; Indicadores Básicos de Saúde; Indicadores de Gestão.

INTRODUCTION

Tuberculosis (TB) is an infectious disease that caused the most deaths from a single agent until the emergence of Covid-19, whose numbers surpassed HIV and malaria combined[1,2]. In 2020, during the pandemic, despite a reorganization of services, turnover of health professionals, difficulties in diagnosis, and, consequently, in reporting[3], approximately 10 million new cases of TB have been registered, and more than 1.5 million have died from this disease in the world[1].

Understanding such an epidemiological reality, which persists as an emerging public health problem, is possible by using health indicators, which evaluate the extension and magnitude of a characteristic or occurrence of a problem in each population[4].

Health indicators contribute to the description and monitoring of the health situation and the foundation of the decision-making process, in which the planning and execution of actions are carried out considering the priorities in the territories and the local reality[5] if they are sensitive and specific to measure what is intended. However, the central element for this monitoring and evaluation is carried out by recording data, which, when analyzed and interpreted, constitute information for knowledge/decision and, consequently, action[4,5].

It is noticed that the fragility in the record compromises the understanding of the scenario and the follow-up regarding the effectiveness of the measures implemented, in the daily practices and work process of the teams in the health services, continuously and on time. Such aspects even interfere with establishing and strengthening actions to promote health and prevent diseases and injuries, considering the implications of social and commercial determinants of health and inserting intersectoral policies and measures[6].

For infectious and contagious diseases such as TB, expanded care and the implementation of lines of care contribute to the comprehensive management of index cases, investigation of contacts, and, consequently, disease control, which are essential for surveillance and can be carried out using different health indicators, such as epidemiological and operational ones[7,8].

Thus, according to the national and international literature, this study aimed to analyze the health indicators used to carry out the situational diagnosis of TB.

METHODOLOGICAL PROCEDURES

It is an integrative literature review developed in stages, which included the formulation of the research question; inclusion and exclusion criteria; search in databases; critical evaluation of the study for the selection of eligible publications; extraction, analysis, and interpretation of data; and synthesis of the results found[9].

The research question - "How have health indicators been used to carry out the situational diagnosis of TB?" was elaborated based on the PICo[10] strategy, in which P (population) corresponded to people with TB, I (phenomenon of interest) to health indicators and Co (context) to the situational diagnosis, which was used as an eligibility criterion.

For the search strategy, we used the terms indexed in Health Sciences Descriptors (DeCS), Medical Subject Headings (MESH), and Embase Subject Headings (Emtree), with their respective synonyms in Portuguese, English, and Spanish, combined through the Boolean operators AND and OR (Chart 1).

The bibliographic search took place in November 2021. The Journal Portal of the Coordination for the Improvement of Higher Education Personnel (CAPES) was used for this, through remote access, in the databases of the Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), *Medical Literature Analysis and Retrieval System Online*/ PubMed (MEDLINE) and EMBASE (Elsevier) in the search field for title, abstract and keywords. Notably, in LILACS, the search was carried out using the terms found in the three languages and, on the other bases, only in English.

Chart 1. Search expressions in Portuguese, English, and Spanish used in the databases for this integrative literature review, Porto Velho, Rondônia, Brazil, 2021.

PICo*	Terms used for bibliographic search
Population: Tuberculosis	**Tuberculose** OR TB OR **Tuberculosis** OR Tuberculoses
	AND
Phenomenon of Interest: Health Indicators	**"Indicadores Básicos de Saúde" OR "**Indicador de Saúde" OR "Indicadores de Resultados" OR "Indicadores de Saúde" OR "Indicadores do Nível de Saúde" OR "Medição de Risco em Saúde" OR "**Health Status Indicators" OR "**Health Risk Appraisal" OR "Health Status Index" OR "Health Status Indicator" OR "Health Status Indices" OR "**Indicadores de Salud" OR "**Indicador de Salud" OR "Indicadores Básicos de Salud" OR "Indicadores de Efecto" OR "Indicadores de Resultados" OR "Índice de Nivel de Salud" OR "Índice del Estado de Salud" OR "Medición de Riesgo en Salud" OR "Valoración del Riesgo de Salud" OR "**Avaliação de Resultados em Cuidados de Saúde" OR "**Análise de Resultados" OR "Estudos de Resultados" OR "Medidas de Desfecho" OR "Monitoramento de Resultados" OR "Pesquisa de Resultados" OR "**Outcome Assessment, Health Care" OR "**Outcome Measure" OR "Outcome Studies" OR "Outcomes Research" OR "Outcome Assessment" OR "**Evaluación de Resultado en la Atención de Salud" OR "**Indicadores de los Resultados" OR "Medidas de los Resultados" **OR "**Indicador Índice" OR "Indicadores Estatística" **OR "**Indicador Índice" OR "Indicators Statistics" **OR "**Indicador Estatística" OR "Indicador Índice" OR "**Indicadores Compostos" OR "Composite Indicators" OR "Indicadores Compuestos" OR "Indicadores de Gestão" OR "Management Indicators" OR "Indicadores de Gestión" OR "Indicadores de Morbimortalidade" OR "Indicators of Morbidity and Mortality" OR "Indicadores de Morbimortalidad" OR "Indicadores de Serviços" OR "Indicators of Health Services" OR "Indicadores de Servicios" OR "Indicadores de Desigualdade em Saúde" OR "Health Inequality Indicators" OR "Indicadores de Desigualdad en Salud" OR "Indicadores de Doenças Crônicas" OR "**Vigilância de Doença Crônica" OR "**Chronic Disease Indicators" OR "**Chronic Disease Surveillance" OR "**Indicadores de Enfermedades Crónicas" OR "**Vigilancia de Enfermedades Crónicas" OR "**Indicadores de Qualidade em Assistência à Saúde" OR "**Indicadores da Eficiência do Sistema de Saúde" OR "**Quality Indicators, Health Care" OR "**Healthcare Quality Indicator" OR "**Indicadores de Calidad de la Atención de Salud" OR "**Indicadores de Rendimiento del Sistema de Salud"

* Context: health situation was used as an eligibility criterion. **Source:** Elaborated by the authors (2022).

The inclusion criteria were primary studies with full texts published in Portuguese, English, and Spanish. And as exclusion, duplicate articles, secondary studies (literature reviews), reflections/debates, monographs, dissertations, theses, comments, letters, editorials, and technical productions (protocols and manuals). It should be noted that there was no limit to the publication period in the search and selection of articles.

Subsequently, the publications were exported to the online reference manager Rayyan QCRI of the *Qatar Computing Research Institute*[11] for selection of studies by reading and evaluating the title and abstract by two independent researchers, whose disagreements were resolved by a third researcher, considering the eligibility criterion, that is, the use of health indicators to carry out the situational diagnosis of TB.

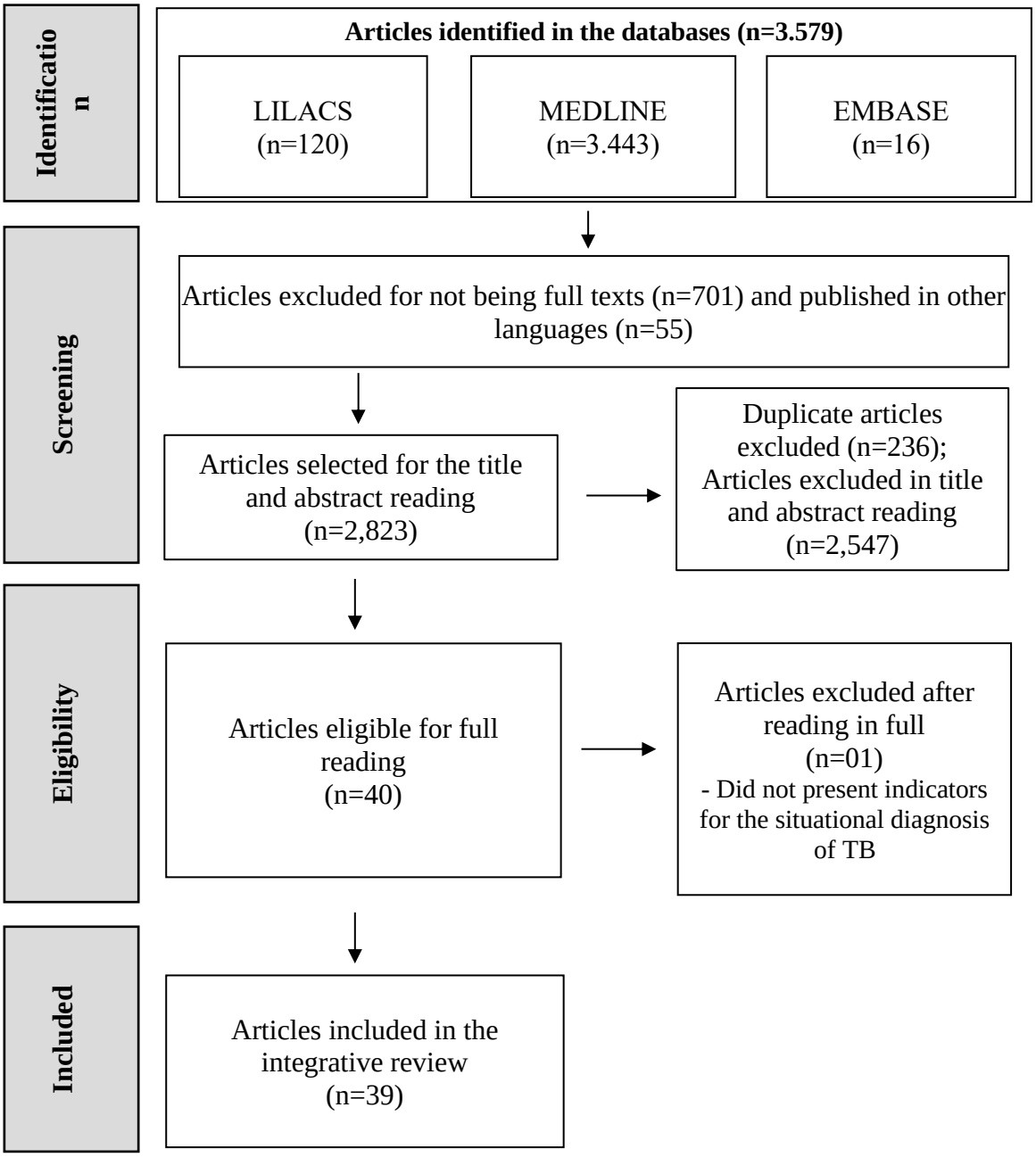
The eligible studies were read in full, aiming at their standard inclusion in the review. The interpretation and synthesis of the results of the included publications were performed using an adapted data extraction instrument based on Ursi (2005)[12], which addresses the identification of the article, methodological characteristics, and main results.

RESULTS

In this study, 3,579 publications were found in the databases through the search expression used. Of these, 701 were excluded for not being complete texts, 55 for being published in other languages , and 236 for duplication. After reading the titles and abstracts, 2,547 publications were excluded for not addressing the proposed topic and/or for not being primary studies. Thus, 40 studies were eligible for full reading, of which only one was excluded because it presented a list of clinical factors that did not correspond to the use of indicators for the situational diagnosis of TB. Thus, 39 articles composed this review (Figure 1).

Of the total number of articles included in this review, most were published in English between 1989[37] to 2021[17] in journals that stand out in public health and TB knowledge. In addition, 13 studies were carried out in the Brazilian scenario[15-17,22,24,25,27,28,34,36,45,48,52], while the others in the international scenario, five in Cuba[18,38,39,43,47], three in Spain[26,37,42], three in China[30,32,51], two in India[14,46], two in the United States[19,33], and one in the Democratic Republic of Congo[50], Sudan[20], Chile[21], Romania[23], Ethiopia[29], Turkey[31], Switzerland[40], Peru[44], Republic of Ghana[49], Republic of Guinea-Bissau[35] and an article in an uncited study setting[41] (Table 2).

Figure 1. Flowchart of the steps for selecting articles for this integrative review. Porto Velho, Rondonia, Brazil, 2021.



Source: Adapted from Moher *et al.* (2008)[13]

All articles included were studies with a quantitative design, of which 23 were descriptive[14,19-21,23,25,26,29,32-37,39-42,44,47,49-51], seven cross-sectional studies[22,24,30,38,43,45,52], six ecological studies[15-17,27,28,48], one retrospective cohort[31], one controlled clinical trial[46] and one quasi-experimental study[18] (Chart 2).

Chart 2. Characterization of the studies included in this integrative review, according to the authors, country, year, journal of publication, design, and objectives. Porto Velho, Rondonia, Brazil, 20.

Authors	Country, year, and journal of publication	Study design	Objective of the study
Bansal et al[14]	Índia/ 2014/ Int J Tuberc Lung Dis	Descriptive/ Quantitative	Develop a new composite indicator tool based on a logical structure path.
Castro et al[15]	Brasil/ 2016/ PloS ONE	Ecological/ Quantitative	A To analyze the relationship between the spatial distribution of TB incidence in the municipalities and regions of Amazonas with socioeconomic factors, the performance of health services, and the indigenous component of TB from 2007 to 2013.
Ceccon et al[16]	Brasil/ 2017/ Epidemiol Serv Saúde	Ecological/ Quantitative	To analyze the ecological association between TB mortality and sociodemographic health and access to health services indicators in Brazilian state capitals and the Federal District.
Cortez et al[17]	Brasil/ 2021/ J Bras Pneumol.	Ecological/ Quantitative	Identify the determinants of TB variables in the different regions of Brazil and assess the trends of these variables over the ten years before the end of the period defined for the United Nations MDGs
Dominguéz et al[18]	Cuba/ 2014/ Rev Ciencias Médicas	Quasi-experimental/ Quantitativo	Evaluate the diagnosis of TB by the synthetic indicator of the location of cases in health services as a method of punctuality in the diagnosis of TB
Ehman et al[19]	Estados Unidos/ 2013/ Journal of Public Health Management and Practice	Descriptive/ Quantitative	Create and evaluate the use of a set of indicators to measure TB prevention and control performance in California.
Elmadhoun et al[20]	Sudão/ 2016/ East Mediterr Health J	Descriptive/ Quantitative	To describe the epidemiology of TB in Nile River State and compare treatment outcomes with WHO-recommended indicators.
Fica; Herrera; Aguilera[21]	Chile/ 2019/ Rev. méd. Chile	Descriptive/ Quantitative	To assess recent epidemiological trends, geographic extent, and potential factors associated with the reemergence of TB in Chile.
Galesi; Almeida[22]	Brasil/ 2007/ Rev Bras Epidemiol	Cross-sectional/ Quantitative	To study the sociodemographic and clinical epidemiological characteristics of hospitalized patients with TB residing in the city of São Paulo in 2001; and calculate, through the variables found, morbidity and mortality indicators for patients hospitalized with TB
Golli et al[23]	Romênia/ 2019/ Int J Tuberc Lung Dis	Descriptive/ Quantitative	To describe changing trends in key TB epidemiological indicators in Romania from 1995 to 2016

Gonçalves; Penna[24]	Brasil/ 2007/ Rev. Saúde Pública	Cross-sectional/ Quantitative	To analyze Brazilian municipalities according to epidemiological surveillance data on TB and AIDS and the operational performance of the National TB Control Program.
Gonzáles et al[25]	Brasil/ 2008/ Rev. Latino-Am. Enfermagem	Descriptive/ Quantitative	To analyze the performance of health services in TB control through coverage indicators, use of resources, speed of performance, monitoring of medication administration, and time spent per home visit in TB Control Programs that implement DOTS/ST
Gutiérrez et al[26]	Espanha/ 1999/ Gaceta Sanitária	Descriptive/ Quantitative	To describe the consumption of antituberculosis drugs in Spain in 1985–1995, compare its temporal evolution and geographic pattern with TB notification, and estimate the number of people who received antituberculosis treatment in 1995.
Heck; Costa; Nunes[27]	Brasil/ 2013/ Ciência & Saúde Coletiva	Ecological/ Quantitative	To describe the trend of TB indicators about its prevalence and incidence and the percentages of case outcomes at closure (cure, treatment abandonment, or death) of patients who entered the Program in Sapucaia do Sul, RS, between 2000 and 2008.
Jacobs; Pinto Junior[28]	Brasil/ 2019/ Ciência & Saúde Coletiva	Ecological/ Quantitative	To classify Brazilian municipalities according to the presence of DR-TB cases, sensitive TB cases, or absence of TB cases in 2014, and describe their demographic and socioeconomic characteristics, as well as the population's health conditions and specifically for TB control to support TB control actions in the country.
Kebede et al[29]	Etiópia/ 2019/ PLoS ONE	Descriptive/ Quantitative	To evaluate the use of quality indicators for the rapid molecular Xpert MTB/RIF test in Ethiopia and compare the findings with predefined targets described in the literature.
Khan et al[30]	China/ 2017/ Health Policy and Planning	Cross-sectional/ Quantitative	To investigate whether the prolonged delay in identifying and correctly treating patients with TB, which is not routinely monitored, persists even when a well-functioning TB control program and global targets are being met.
Kurt et al[31]	Turquia/ 2012/ Cent Eur J Public Health	Retrospective cohort/ Quantitative	To identify and evaluate problems in regional TB control studies using international TB indicators
Li et al[32]	China/ 2014/ BMC Infectious Diseases	Descriptive (*two-round modified Delphi method*)/ Quantitative	To establish a framework of behavioral indicators for assessing TB health promotion outcomes among TB suspects and TB patients.

Lopez de Fede et al[33]	Estados Unidos/2008/ Int J Tuberc Lung Dis	Descriptive/ Quantitative	Assessing TB risk in three locations across the United States - Chicago, Illinois; Fulton County, Georgia; and the state of South Carolina - using two neighborhood-level survey measures of deprivation and a geographic information system.
Macedo; Maciel; Struchiner[34]	Brasil/ 2017/ Epidemiol. Serv. Saude	Descriptive/ Quantitative	To describe sociodemographic and clinical characteristics and indicators for monitoring and evaluating TB cases in Brazil's population deprived of liberty from 2007 to 2013.
Manjuba; Nogueira; Abrahão[35]	República da Guiné-Bissau/ 2008/ Rev Bras Epidemiol	Descriptive/ Quantitative	To study the Republic of Guinea-Bissau and its Provinces, the epidemiological situation of TB from 2000 to 2005.
Maronna; Souza; Montes[36]	Brasil/ 2017/ J Bras Patol Med Lab	Descriptive (*process mapping method*)/ Quantitative	To describe the quality indicators defined through the process mapping method to promote and raise the quality and reliability of the different laboratory processes carried out in the national reference laboratory in TB.
Matutano et al[37]	Espanha/ 1989/ Gaceta Sanitaria	Descriptive/ Quantitative	To know the absolute magnitude of TB and its impact on a population served by the Sagunto Hospital, which assists 127,696 people, of which 32,113 are under 15 years old.
Murcia et al[38]	Cuba/ 2009/ Revista Médica Electrónica	Cross-sectional/ Quantitative	Evaluate the epidemiological indicators of the Program for TB Control in the province of Matanzas in the first seven years of the new millennium
Pérez et al[39]	Cuba/ 2015/ Rev Cubana Med Trop	Descriptive/ Quantitative	To assess the validity, reliability, accessibility, and feasibility of two composite indicators that reflect the intensity and quality of TB case detection.
Raviglione et al[40]	Suíça/ 1997/ The Lancet	Descriptive (*evaluative*)/ Quantitative	To evaluate the performance of national TB programs; assess the extent of implementation of the WHO TB control strategy; and compare regions that have adopted the WHO strategy and those that have not.
Rieder et al[41]	Não foi citado/ 2011/ Int J Tuberc Lung Dis	Descriptive/ Quantitative	Critically discuss calculations for epidemiological indicators of TB burden in prisons and provide recommendations to improve the comparability of studies.
Rodrigo et al[42]	Espanha/ 2001/ Int J Tuberc Lung Dis	Descriptive/ Quantitative	To evaluate the effectiveness of the Barcelona TB Control Program and propose evaluation indicators.
Rodríguez et al[43]	Cuba/ 2011/ Revista Médica Electrónica	Cross-sectional/ Quantitative	To evaluate the epidemiological indicators of the TB Control Program, in the municipality of Matanzas, for better control of the disease and determine in what phase of elimination this entity is to declare that the disease is not a health problem.

Roque-Henríquez et al[44]	Peru/ 2015/ Revista Peruana de Medicina Experimental y Salud Publica	Descriptive (*operational research*)/ Quantitative	To evaluate the operational detection indicators established in the Technical Health Standard for Comprehensive Care for People Affected by TB in three micro-networks in Tacna with a very high risk of transmission.
Santos et al[45]	Brasil/ 2016/ Int J Mycobacteriol	Cross-sectional/ Quantitative	To analyze the feasibility of quality indicators for evaluating hospital programs for occupational TB prevention.
Selvakumar et al[46]	Índia/ 2012/ Int J Mycobacteriol	Controlled clinical trial/ Quantitative	To document laboratory indicators for a solid culture system (Lowenstein-Jensen medium) in a mycobacteriology laboratory for four years (2007-2010).
Severo et al[47]	Cuba/ 2008/ Rev Cubana Hig Epidemiol	Descriptive (*intervention*)/ Quantitative	To evaluate the feasibility and results of applying a synthetic indicator, such as evaluating an intervention in two municipalities in the city of Havana.
Silva et al[48]	Brasil/ 2020/ Epidemiol. Serv. Saúde	Ecological/ Quantitative	To identify Brazilian micro-regions with underreporting TB cases from 2012 to 2014.
Tender et al[49]	República do Gana/ 2020/ Ghana Med J	Descriptive/ Quantitative	To assess progress toward updating the 80% reduction in incident cases, monitor trends, and assess the quality of Ga West County TB surveillance data from 2012 to 2016
Van Deun et al[50]	República Democrática do Congo/ 2007/ Int J Tuberc Lung Dis	Descriptive/ Quantitative	To identify and validate suitable indicators to assess the quality of BAAR microscopy using laboratory records from Kinshasa, Province of the Democratic Republic of Congo.
Wei et al[51]	China/ 2016/ PLoS ONE	Descriptive/ Quantitative	To know the epidemiological characteristics of TB and HIV-positive cases in patients with TB (TB/HIV co-infection) through a demographic, temporal, and spatial study in Urumqi.
Wysocki et al[52]	Brasil/ 2017/ Rev Bras Epidemiol	Cross-sectional/ Quantitative	To evaluate the performance of PHC services in treating TB.

Subtitle: Primary Health Care (PHC), Alcohol-Acid Resistant Bacillus (BAAR), Directly Observed Treatment, Short-course (DOTS), Millennium Development Goals (MDG), World Health Organization (WHO), Supervised Treatment (ST), Tuberculosis (TB), Drug-resistant Tuberculosis (DR-TB), Human Immunodeficiency Virus (HIV).**Source:** Elaborated by the authors (2022).

Regarding the use of indicators by the studies, a synthesis of analysis was prepared based on the dimensions: epidemiological, operational, management, quality of actions, health services and programs, logistics of inputs and medicines, socioeconomic and demographic, access to services health, and registration and surveillance systems (Chart 3), which supported the discussion of the findings.

As to using the different types of indicators for each analyzed dimension, it was identified that the epidemiological indicators were used in order to identify the magnitude of the disease through calculations of incidence and prevalence, as well as to quantify the cases of TB in different population groups, TB/HIV co-infection and antimicrobial-resistant TB; the operational indicators had the purpose of monitoring and evaluating the detection, diagnosis, follow-up, treatment and outcome of TB cases, TB/HIV co-infection and LTBI in different population groups; management-oriented indicators were used to assess results, implement TB prevention and care actions by health services, as well as the performance of PCTs (Chart 3).

The indicators that reflect the quality of actions, services, and health programs were used to understand structural, procedural, and organizational aspects related to TB prevention and care actions in health services and programs; the indicators related to the logistics of inputs and medicines were intended to understand the logistics chain that encompasses storage, dispensing, transport, storage, and maintenance of inputs and antituberculosis drugs (Chart 3).

Regarding socioeconomic and demographic indicators, their use was identified for the perception of how different types of inequality (social, economic, educational) determine or influence the risk of illness, occurrence, and maintenance of TB and TB/HIV co-infection in different groups of populations; indicators of access to health services were approached to recognize the territorial dynamics through the coverage of health services and teams, TB prevention actions, management, and outcome of TB in other levels of health care; and the indicators related to the TB registration and surveillance systems were intended to facilitate the understanding of TB notification data to improve the evaluation of control actions and direction of public policies (Chart 3).

Chart 3. Summary of the use of indicators from the analysis dimensions of this integrative review. Porto Velho, Rondônia, Brazil, 2021.

Dimensions	Purpose of use	Indicators
Epidemiological	It allows identifying the magnitude of the disease through calculations of incidence and prevalence, as well as quantifying TB cases in different population groups, TB/HIV co-infection, and antimicrobial-resistant TB.	TB incidence[15,17,19-21,23,24,27,31,33-35,37,38,41-43,48,49]
		Incidence of pulmonary TB with positive bacilloscopy [17,31,35,38,42,43]
		Incidence of extrapulmonary TB [20,31,35,38,43]
		TB prevalence[17,27,35,37,41]
		TB/ HIV co-infection cases[16,20,28,34,38]
		Pediatric TB cases[19,23,38,42,43]
		Pediatric extrapulmonary TB cases[42]
		DR-TB cases[23]
		Cases of relapse, retreatment, and/or re-entry after abandoning TB treatment[17,20,23,28,31,34,35]
Operational	Enables the monitoring and evaluating of detection, diagnosis, follow-up, treatment, and outcome of TB cases, TB/HIV co-infection, and LTBI in different population groups.	Detection of respiratory symptomatics[44]
		TB case detection and localization[14,18,39,42,47]
		Aids case detection[28]
		Performing sputum smear microscopy at the start of treatment[17,20,24,48]
		Performing sputum smear microscopy in the second and sixth-month[17]
		Performing a sputum culture among new cases of pulmonary or laryngeal TB[19,28]
		Performing a sputum culture in patients with prior TB treatment[17,28]
		HIV testing [20,28,34,48]
		Timely and complete reporting of TB cases[19,20,24,42]
		Timely initiation of treatment in less than a week with the recommended four-drug regimen[19]
		Diagnosis of TB among specific groups (people living with HIV/AIDS, indigenous peoples, immigrants, illicit drug users or alcoholics, the elderly, homeless people, health professionals, and prisoners)[19,21,34,38,41]

		Diagnosis of TB among specific groups (people living with HIV/AIDS, indigenous peoples, immigrants, illicit drug users or alcoholics, the elderly, homeless people, health professionals, and prisoners)[42,48]
		Delay in confirming TB and starting treatment[30,42]
		Execution of DOT[17,19,24,28,31,34,42,52]
		Delay in performing the DOT[30]
		Inappropriate self-administered therapy[19]
		Conversion of sputum smear microscopy at the end of the initial phase of treatment[20,31]
		Negative culture conversion ≤60 days from the start of treatment[19]
		Timely completion of TB treatment in ≤12 months[19,20,31,38,40]
		Cases with outcome/closure information[24,34]
		Cure of TB cases[21,23,24,27,28,31,34,35,38,40,52]
		The abandoning TB treatment[17,20,21,23,27,28,31,34,35,40,42,52]
		TB treatment failure[20,28,31,35,38,40]
		Transfer of TB cases[20,28,31,35,40]
		Cases that were transferred who completed treatment in ≤ 12 months[19]
		TB death[16,17,19-23,27,31,34,35,38,40,52]
		Identification and examination of contacts[19,37,42]
		Initiation of LTBI treatment by TB contacts[19]
		Completion of LTBI treatment by contact[19]
Management	It facilitates the evaluation of results, implementation of TB prevention and care actions by health services, and the performance of PCTs.	Human Resource Management [14]
		Financial management [14]
		Performance Index of the Unified Health System[15]
		The capacity of TB prevention and control programs[19]
		Training of professionals through the PCT[51]

Quality of actions, services, and health programs	Promotes understanding of structural, procedural, and organizational aspects of TB prevention and care actions in health services and programs.	Coverage, use of resources, and agility of performance per home visit in PCTs that run DOTS[25]
		Participation of professionals in caring for people affected by TB[52]
		Information about TB[52]
		External actions for TB control[52]
		Reference and counter-reference[52]
		Articulation with other levels of care[52]
		Social support[42]
		Collaborative TB/HIV Activities[14]
		Participation of NGOs/private providers and community involvement[14]
		Laboratory quality and reliability[36,46,50]
		Quality of diagnostic services by Xpert MTB/RIF molecular rapid test[29]
		Time spent per home visit in TB Control Programs running DOTS[25]
		Monitoring medication administration by home visit in TB Control Programs that implement DOTS[25]
		Promotion of behavioral health of people affected by TB[32]
		Evaluation of the Occupational TB risk prevention structure[45]
		Evaluation of the incidence of conversion in the tuberculin skin test and TB among health professionals[45]
		Assessment of worker compliance with occupational TB prevention measures[45]
Logistics of supplies and medicines	Enables understanding of the logistics chain of supplies and medicines, which includes storage, dispensing, transport, storage, and maintenance.	Availability and stock of medicines[14]
		Dispensing of antituberculous drugs[26]
		Transport[14]
		Availability of inputs[52]
		Storage and maintenance of inputs[14]

Socioeconomic and Demographic	It provokes the perception of how the different types of inequality (social, economic, educational) determine or influence the risk of illness, occurrence, and maintenance of TB and TB/HIV co-infection in different population groups.	Gini Index[15,16,21,28]
		Human Development Index[15-17,28]
		Gross Domestic Product[28]
		Average household income per capita[15,28]
		Percentage of the population below the poverty line[21,28,33]
		The proportion of the population in poverty[15,16]
		The proportion of children in poverty[15]
		The proportion of people of skin color or black race[16,51]
		Illiteracy rate[16,28]
		Population unemployment rate[15,16,28]
		Migration rate[16]
		Demographic density[17,28]
		The population that shares a dormitory with two or more people[28]
		Urban population[28]
		Life expectancy at birth in years[28]
		Child mortality[28]
		Townsend Deprivation Index (a measure of socioeconomic disadvantage that reflects the relative degree of local household crowding, unemployment, and car and home ownership)[33]
		Priority and non-priority municipalities[24]
		Metropolitan and non-metropolitan regions[24,28]
		Urban or rural area[51]
		Occupation of the population[51]
		Population age range[51]
		The population size of municipalities[24,28]

Access to health services	It makes it possible to recognize the territorial dynamics through the coverage of health services and teams, TB prevention actions, management, and outcome of TB at other levels of health care.	PHC coverage[17,28]
		Population coverage of the Family Health Strategy[16]
		Population coverage of Community Health Agents[16]
		Coverage of TB management units (other countries)[20]
		The ratio of physicians per thousand inhabitants [16]
		The density of doctors/ nurses/ pharmacists[17]
		BCG vaccine coverage[17]
		Hospitalization for PHC-sensitive conditions[17]
		TB hospitalizations[16,17,22]
		Time and cost of hospitalization for TB[17]
		Hospital mortality from TB[17,22]
Registration and surveillance system	Facilitates the understanding of TB notification data to improve the evaluation of control actions and the direction of public policies.	Completeness of data from the Brazilian national notifiable disease information system[48]
		Access to TB registration instruments[52]

Subtitle: Primary Health Care (PHC), Bacillus Calmette-Guérin (BCG), Directly Observed Treatment, Short-course (DOTS), Latent Tuberculosis Infection (LTBI), Non-Governmental Organizations (NGOs), TB Control Programs (PCTs)), Directly Observed Treatment (DOT), Tuberculosis (TB), Drug Resistant Tuberculosis (DR-TB), Human Immunodeficiency Virus (HIV).
Source: Elaborated by the authors (2022).

DISCUSSION

Regarding the use of epidemiological indicators, it was identified that TB remains high and complex in different countries, where in many cases, it is associated with the growth in the percentage of groups at risk and vulnerability, with the rate of poverty, unemployment and inequality social[15,21,24,33,41], the increase in cases of HIV/aids[24,35], together with the weakening of PCTs, budget cuts, operational problems and shortage of human resources in health services[21].

For DR-TB, a study carried out in Romania reported its growth in Europe, making monitoring using incidence indicators essential, in addition to ensuring the effectiveness of measures for its control, such as strengthening the network of PHC, especially in rural areas and DOT, aiming at adequate follow-up and adherence to treatment[23]. It is because resistance contributes to an increase in worse outcome indicators, such as mortality, and continuity of the transmission chain of resistant bacilli, including to more than one drug[23,28].

In the child and youth population, the results of the TB incidence indicators demonstrate the need for epidemiological surveillance that investigates the source of infection and intra- and extra-domiciliary contacts, with timely initiation of chemoprophylaxis for positive cases, to contribute to the interrupting the chain of transmission and progression of TB and helping to improve the epidemiological indicators of the disease[37].

On the other hand, other studies show that, based on epidemiological indicators, it is possible to verify that TB has been improving in some places, being evaluated as favorable to eliminating this disease as a public health problem[38,43]. This allows saying that PCTs should use such indicators to compare the evolution and course of this condition, aiming at improvements in TB prevention, care, and control[42].

Concerning operational indicators, the literature highlights their importance for monitoring and evaluating TB cases' detection, diagnosis, follow-up, treatment, and outcome. In this sense, three studies presented the use of a synthetic indicator of the location of TB cases as a good instrument to measure the detection of cases and improve the timely diagnosis of the disease, making them useful for PCTs and qualify the performance of health professionals in the case detection process in the territory[18,39,47].

In addition, a study in Turkey identified improvements in the operational indicators of diagnosis and treatment from the implementation of DOT[31]. This shows that the inclusion of TB surveillance among the priority activities of the PHC health teams and the expansion of the DOTS strategy can contribute to achieving the goals for disease control[27,40].

However, it is still observed that some operational indicators, based on their results, show significant weaknesses to be considered, including the low quality of screening for respiratory symptoms, the use of sputum smear microscopy for diagnosis and monthly follow-up, and the active search of contacts of TB cases with positive bacilloscopy[21,31,35,44]. In some scenarios, this is exacerbated by the increase in TB cases in populations with greater susceptibility to the disease, such as immigrants, drug addicts, indigenous people, homeless people, people deprived of liberty, and cases of TB/HIV co-infection[21].

For the outcome of TB treatment, it appears that success (cure) or failure (abandonment and death) are the leading operational indicators used to monitor the behavior of the disease, based on their calculations and critical analyses, both for the population in general and for those at greater risk of acquiring TB[34], in addition to assisting in the evaluation of actions implemented by PCTs[40]. From this, it was possible to observe high proportions of mortality and treatment abandonment and low cure rates in different countries[21,27], especially among those with greater income inequality, migration, poverty, and the occurrence of TB/HIV co-infection[16].

As for indicators related to management, two studies proposed the creation of a logical structure from a set of indicators designed to advance in the evaluation of results that have a more local focus and encourage a deeper analysis of the implementation of prevention and care actions, and the performance of the PCTs, to identify gaps, weaknesses and directing measures for their improvements[14,19].

The quality of actions, services, and health programs could be identified from the indicators used by some studies in this review. These were transversal to the structural aspects related to the prevention of the risk of occupational TB[45], qualification of health professionals[52], laboratory quality[29,36,46,50], procedures involving the use of resources, and internal and external actions for TB control, such as the implementation of the DOTS strategy[25,52] and organizational, such as care coordination through referral and counter-referral[52].

In this sense, studies that work with this analytical focus advance to investigate possible causes of indicators outside acceptable targets or that compromise the quality of these actions and services to monitor, evaluate and

improve prevention activities and treatment follow-up by health professionals and policymakers and, consequently, reflect on the performance of PCTs[25,32,52].

Regarding the indicators related to the logistics of inputs and medicines, a study in Spain found that the consumption of antituberculosis medicines provides information of great interest for knowing the epidemiological situation of TB, especially the incidence of the disease through the treatment regimen with pyrazinamide. However, this indicator does not replace the need to use robust epidemiological surveillance systems as essential tools for monitoring disease prevention, coping, and control actions[26].

To support programmatic actions aimed at TB, especially about focusing and prioritizing strategic areas for specific population groups, studies show the importance of including the analysis of socioeconomic and demographic indicators in order to help in understanding how they determine or influence the risk of illness, the occurrence and maintenance of TB and TB/HIV co-infection[15,28,51]. It allows public health professionals and/or managers to recognize the shortcomings of political initiatives that do not incorporate demographic issues[33].

In addition, these indicators make it possible to identify the association between TB and economic or income inequality, measured by the Gini index, which, added to the difficulties in accessing health services, compromises the screening and follow-up of people living with TB and maybe a factor associated with mortality from this disease[15,16]. Other indicators that contribute to the analysis of these associations are those related to poverty, social deprivation, unemployment rate, immigration, and population density [15,33,51].

Although these indicators are associated with structural issues in the social determination of TB, it is suggested that actions to minimize the risks of illness or unfavorable outcomes of treatment linked to the results of these indicators should permeate the qualification of professionals, their processes of work, and their support network[28].

Other studies that analyzed access to health services for TB prevention and care listed some indicators, such as the level of PHC coverage, which make it possible to understand how regional differences should be considered and adapted

to cover the capacity of healthcare systems to offer quality care and centered on universal access for the population in different countries[17,30].

Also, access indicators with worrying results, such as the rate of hospitalizations and lethality due to TB, show that the severity of the cases is not related to some comorbidities, such as TB/HIV co-infection, but can mean the late diagnosis of the disease and the weaknesses in the follow-up of people affected by TB, to guarantee the continuity of treatment in the PHC services[22].

Furthermore, finally, concerning the indicators referring to the TB registration and surveillance systems, a study carried out in Brazil proposed an indicator to analyze the average acceptability of the surveillance system to identify micro-regions with unsatisfactory surveillance of this condition, that is, those with a low proportion of cases that underwent bacilloscopy and adhered to TB treatment[48].

It is understood that the quality of data and information allows better evaluations of control actions carried out by PCTs[40,49], in addition to helping direct public policies aimed at improving surveillance, detection, diagnosis, and notification of cases of TB[20,48].

This study is limited by the number of databases used, which may have limited the identification of other studies that could contribute to understanding the theme.

FINAL CONSIDERATIONS

Considering the literature, the use of indicators is considered an essential tool within the health assessment of a given epidemiological condition, such as TB, allowing to identify how it behaves concerning epidemiology, the operationalization, and quality of actions to their prevention and care, as well as the organization of services, health programs, logistics of inputs and medicines, registration, and surveillance systems in different locations. In addition, it contributes to understanding how socioeconomic and demographic aspects interfere with the occurrence of this disease and how people affected by TB manage access to health services.

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