Supplementary Table 1. Fragments of the key information from the 35 articles included in the study.

ID	First author, year and doi	Title	Objective	Fragments of information found	Conclusion
E1	Joshua *et al.,* 2008 10.1186/1476-072X-7-40	A Bayesian approach to study the space time variation of leprosy in an endemic area of Tamil Nadu, South India	To examine the variation in the prevalence of leprosy using four Bayesian models (...) and to explore possible factors that might have influenced these variations in the study area	population density of about 1,427 per sq km which is two times higher than the district and three times higher than the state population density (...) observed that nearly 37% of the people from this pocket belong to the economically poorer strata	panchayat or spatial effects using Bayesian showed clustering of leprosy cases towards the northeastern end of the study area which was overcrowded and population belonging to poor economic status.
E2	Argaw *et al.,* 2006 10.4081/gh.2006.285	A geospatial risk assessment model for leprosy in Ethiopia based on environmental thermal-hydrological regime analysis	assess the influence of environmental factors on the prevalence of leprosy in Ethiopia	thermal-hydro-logical regime risk factors for leprosy were measured by conventional climate station data or by satellite-sensor data on NDVI and Tmax as surrogates of moisture and temperature, respectively	Certain thermal-hydrological regimes favour survival of leprosy in the environment

E3	Souza et *al.,* 2019 10.1590/abd1806-4841.20197554	Spatial modeling of leprosy in the state of Bahia and its social determinants: a study of health inequities	To analyse the spatial distribution of Hansen's disease in the State of Bahia and the association between its occurrence and the synthetic indicators of municipal socioeconomic performance, of social vulnerability and income inequalities.	only the IPESE indicator "economy and finances" had a significant coefficient of regression for two dependent variables: coefficient of detection of new cases of Hansen's disease in the general population and in younger than 15 years (…) Moran's statistics showed that both had spatial dependency: coefficient of general detection and coefficient of detection in younger than 15 years	Only the Index of Social and Economic Performance (IPESE)-Economy and Finance composed the final regression model of the general detection coefficients and in children under 15 years old. The municipalities with the highest indexes had the highest detection coefficients, reflecting the capacity to diagnose new cases.
E4 *	Mencaroni *et al.,* 2004 10.47878/hi.2004.v29.35243	Spatial analysis of the leprosy endemic in the urban area of Fernandópolis/ SP	To analyse the leprosy endemic in the urban area of the Fernandópolis municipality, according to its spatial distribution,	the large hyperendemic area in the west of the urban area is made up of census tracts with low population density.	The proposed method helped to detect socio-economic inequalities and identify consistency with the distribution patterns of leprosy occurrence, identifying risk areas.

			discussing its relationship with the population's living conditions		
E5 *	Amaral & Lana, 2008 10.1590/S0034-71672008000700008	Spatial analysis of Leprosy in the microregion of Almenara, MG, Brazil	To analyse the epidemiological status of Hansen's disease in the microregion of Almenara, State of Minas Gerais, according to its spatial distribution and its relations with the socioeconomic conditions of the population	the majority of leprosy cases were located in sectors classified as low risk (Health Vulnerability Index).	It can be concluded that the structure and organisation of health services have a greater influence on the current epidemiological situation of leprosy in the Almenara micro-region than socio-economic factors
E6 *	Borba *et al.,* 2021 10.26848/rbgf.v14.3.p1513-1529	Spatial analysis and epidemiological profile of leprosy as a subsidy for identifying socio-environmental risks and	To describe the epidemiological profile of patients and to carry out the spatial analysis of leprosy relating to socio-	the General Linearised Models (GLMs) indicated that there is a significant relationship between the different socio-economic variables analysed (illiteracy rate, average per capita income, form of health	The generalized linear models indicated a relationship between the forms of the disease and the number of cases with the demographic and socioeconomic variables analysed: illiteracy,

		vulnerabilities in Rondônia, BR	environmental variables in the state of Rondônia	destination, percentage of Primary Health Care coverage and percentage of municipal conditions sensitive to primary health care	average income, sanitary destination, primary health care.
E7 *	Souza *et al.,* 2001 10.1590/S0034-89102001000500011	Empirical bayesian model applied to the spatial analysis of leprosy occurrence	To analyse the spatial distribution of leprosy, identify areas of potential case underreporting or high transmission risk, and to assess the ecological association of leprosy distribution with multibacillary cases	is likely to be influenced by the operational procedures of the control programme (...) areas with high population densities and significant concentrations of people with poor living conditions	The Bayesian method allowed to reassess epidemiological indicators based on data from neighbouring spatial units. This enabled to identify areas that should be prioritized in municipal control programs, either because of underreporting of cases or the higher number of occurrences related to multibacillary forms in individuals under 15
E8 *	Souza *et al.,* 2020a	Spatial modelling of leprosy in the state of Bahia, Brazil, (2001-	To analyse the spatial distribution of leprosy in	population density; proportion of urban population; collective household with resident; proportion	For the general detection coefficient, five variables composed the final model:

	10.1590/1413-81232020258.21522018	2015) and social determinants of health	Bahia and associated social determinants	of people aged 60 or over in the population; proportion of illiterate people aged 15 and over; proportion of households with inadequate sanitation; average monthly per capita income; proportion of extremely poor; number of households with a density of more than three people per bedroom; occupation level of individuals aged 10 and over; households with no income; families with six or more cohabitants in the household; head of household and spouse with no income; proportion of one-person households; number of permanent private households connected to the general water supply network; number of permanent private	demographic density, urban population proportion, per capita income, proportion of extremely poor and households with over three people per dormitory. The illiteracy proportion made up the final model for the grade II rate of physical disability

				households without a bathroom for the sole use of the household; number of permanent private households with rubbish collected	
E9	Santos *et al.,* 2019 10.1136/bmjopen-2018-023420	Clinical and epidemiological indicators and spatial analysis of leprosy cases in patients under 15 years old in an endemic area of Northeast Brazil: an ecological and time series study	To analyse the clinical and epidemiological indicators, temporal trends and the spatial distribution of leprosy in patients under 15 years old in an endemic area of Northeast Brazil.	the spatial analysis brings new advantages to comprehend the leprosy dynamic, and reinforce the superimposed regions of high occurrence areas of patients presenting degree 2 of physical disability and cases in children lower than 15 years	The data indicate that there is a persistence of active *Myobacterium leprae* transmission and a delay in disease detection, following a pattern of high endemicity in many municipalities. The early detection by HHC** examination is important to stop transmission and also to detect the cases in a less severe state
E10	Souza *et al.,* 2020b 10.1590/1980-549720200007	Leprosy and social deprivation:	This study aimed to analyse social deprivation in the municipalities of Bahia and its relation with	additionally, Moran statistics showed spatial dependence of the SDI with a large area with high and very high social deprivation.	It was concluded that the worst conditions acted as an impediment to the diagnosis, while increasing the risk of

		Definition of priority areas in an endemic state Northeastern Brazil	the detection of new cases of leprosy in the population.		illness. Good conditions have the opposite effect.
E11	Marciano *et al.,* 2018 10.1590/0102-311X00197216	Epidemiological and geographical characterization of leprosy in a Brazilian hyperendemic municipality	To identify the distribution pattern of leprosy in a hyperendemic municipality in Brazil and determine its relationship with the clinic-epidemiological situation over 11 years	the data did not allow us to infer whether the number of inhabitants was associated with the distribution pattern of high- and low-risk groups (...) observed in the southern region, which is considered a prime area in the city, despite a few cases of the disease during the study period	A reduction in the detection coefficient, increases in high-risk spatial clusters, marked changes in the distribution of high-risk and low-risk clusters, and high-risk clusters of minors under 15 years old were observed from 2006 to 2010, showing recent illness, the presence of active foci, and overlapping of high-risk clusters of multibacillary infection in minors under 15 years old

E12	Ortuño-Gutiérrez *et al.,* 2021 10.1016/j.ijid.2021.05.014	Exploring clustering of leprosy in the Comoros and Madagascar: A geospatial analysis	To identify patterns of spatial clustering of leprosy	compared with those living at ≥100 m from the nearest index case, the risk of leprosy was more than 7 times higher for household members. For neighbours at <25 m, the risk was 2–3 times higher. The association remained statistically significant up to 100 m.	We documented significant clustering of leprosy beyond household level, although 56% of cases were not part of a cluster. Control measures need to be extended beyond the household, and social networks should be further explored.
E13	Queiroz *et al.,* 2010 10.4269/ajtmh.2010.08-0675	Geographic Information Systems and Applied Spatial Statistics Are Efficient Tools to Study Hansen's Disease (Leprosy) and to Determine Areas of Greater Risk of Disease	we conducted GIS-based spatial analysis and used exploratory spatial data analysis and the spatial scan statistics to characterize the geographical distribution of Hansen's disease cases	basic sanitation, literacy and income, level of poverty, water supply (0.7947), household with a toilet (0.7816), and trash collection (0.9390), and negative correlation with dumping the trash outside the household (−0.9054).	Our study shows that the combination of GIS and spatial analysis can identify clustering of transmissible disease, such as Hansen's disease, pointing to areas where intervention efforts can be targeted to control disease.
E14	Duarte-Cunha *et al.,* 2016	Geographic weighted regression:	This study discusses the application of the geographic weighted	the results showed that having a higher proportion of households with running water protected	Epidemiological analysis using the maps of the GWR model offered the advantage of

	10.1590/0037-8682-0307-2015	applicability to epidemiological studies of leprosy	regression (GWR) model to health data to improve the understanding of spatially varying social and clinical factors that potentially impact leprosy prevalence.	against new cases of leprosy to different degrees across the municipality, with the greatest protection in the northeast of the municipality. In addition, the ratio of cases with an indeterminate clinical form to the sum of cases with tuberculoid, dimorphic, and lepromatous clinical forms was positively associated with a higher detection rate, particularly in the south of the municipality.	visualizing the problem in sub-regions and identifying any spatial dependence in the local study area.
E15	Sousa *et al.,* 2020 10.1016/j.jiph.2019.08.006	Hot spots of leprosy in the endemic area of São Luís, Maranhão state, Northeastern Brazil	Aimed to analyse the spatial pattern of leprosy cases and their household contacts in the sanitary districts of Itaqui-Bacanga, Coroadinho, and Tiririca, in the city of São Luís,	it was observed that the areas of greatest intensity of positive ML Flow test between the contacts examined are located in the hot areas of leprosy cases identified by the Kernel. The high-intensity nuclei of both cases and	The spatialization of both leprosy cases and contacts and the identification of areas presenting the highest concentration of the disease in each district is important and

			Maranhão, Northeastern Brazil.	seropositive contacts were located spatially close to each other	constitutes an important tool to subsidize disease-control actions.
E16	Moura *et al.,* 2013 10.1371/journal.pntd.0002093	Active Surveillance of Hansen's Disease (Leprosy): Importance for Case Finding among Extra-domiciliary Contacts	To evaluate clustering/mapping as a tool for identification of high-risk areas of Hansen's disease and the utility of skin and neurological examination during household visits in high-prevalence neighborhoods for identifying new cases of Hansen's disease	the distribution of paucibacillary cases was dependent on presence of multibacillary cases. The newly diagnosed Hansen's disease case distribution was not random; rather it was clustered (...) and was dependent on the presence of multibacillary cases (...) neighbourhoods of worse socioeconomic status as determined by household income, population density and education.	Spatial analysis showed clustering of newly diagnosed cases and association with residential coordinates of previously diagnosed multibacillary cases.
E17*	Rodrigues *et al.,* 2017 10.5935/1415-2762.20170007	Leprosy and health vulnerability in Belo Horizonte, Minas Gerais	The aim of this study was to analyse the spatial distribution of leprosy and its relationship with the Health Vulnerability Index	the results showed that the medians of the detection rates in the very high risk and high risk categories were significantly higher than the	The evidence provided demonstrates the need to intensify measures aimed at improving the population's living conditions, since leprosy in the

				low and medium risk sectors (p <0.001).	municipality is faced with a pattern built on inequalities, as evidenced by its relationship with SVI***.
E18	Sampaio *et al.,* 2013 10.47276/lr.84.4.256	Correlation between the spatial distribution of leprosy and socioeconomic indicators in the city of Vitória, State of ES, Brazil	To identify relationships between the epidemiological status of leprosy and socioeconomic indicators during the period from 2005 to 2009	areas with lower Urban Quality Index (IQU)	The model methodology adopted enabled the verification of the effect of the influence of covariates related to the social determinants of health as well as the spatial structure, in contrast to the gross rate method that does not aggregate this information.
E19	Ferreira *et al.,* 2019b 10.1111/tmi.13343	Leprosy in the North and Northeast regions of Brazil: an integrated spatiotemporal approach	To analyse the spatiotemporal patterns of leprosy occurrence in the North and Northeast regions of Brazil from 2001 to 2017	municipalities with greater social risk are more likely to maintain significant detection of new cases with physical disabilities.	Temporal and spatiotemporal patterns identified in this study confirm that leprosy remains Epidemiologically relevant in vulnerable areas. Surveillance and control interventions are

					needed in municipalities with low detection in the general population, in children and in individuals with G2D, to reduce late diagnosis
E20	Carvalho *et al.,* 2023 10.4081/gh.2023.1227	Intra-urban differences underlying leprosy spatial distribution in central Brazil: geospatial techniques as potential tools for surveillance	To identify spatial patterns of the NCDRs of leprosy in the municipality of Rondonópolis from 2011 to 2017 at the neighbourhood level, and associated demographic, socioeconomic, and structural characteristics underlying this distribution.	smoothed NCDR on the one hand and the percentage of non-white individuals, the mean number of inhabitants per PPH, the percentage of PPHs without income and that of PPHs without bathroom on the other (...) The GWR coefficients were estimated at each location for each predictor. They reveal that the influence of the predictor on the model varied considerably across the study area. In general, literacy rate and mean monthly nominal income per PPH appeared as	Leprosy presented a heterogeneous and peripheral spatial distribution at the neighbourhood level, which seems to have been shaped by intra-urban differences related to deprivation and poor living conditions.

				protective factors for leprosy. (...) Low literacy rates had a strong negative impact on the NCDR, the highest among the northern and western neighbourhoods and lower towards the central and southern areas	
E21	Assis *et al.,* 2018 10.1371/journal.pntd.0006407	Social determinants, their relationship with leprosy risk and temporal trends in a triborder region in Latin America	To evaluate social determinants and their relationship with the risk of leprosy, as well as to examine the temporal trend of its occurrence in a Brazilian municipality located on the tri-border area between Brazil, Paraguay and Argentina	income and brown race were found to be determinants associated with the risk of leprosy.	The social determinants income and race/color were associated with the risk of leprosy. The study's highlighting of these social determinants can contribute to the development of public policies directed toward the elimination of leprosy in the border region.
E22	Ribeiro *et al.,* 2019	Prevalence and spatial distribution of	To analyse the serological profile and spatial	there was also a spatial-temporal relationship between the cases	The serological analysis revealed that the cohabitation condition

	10.15253/2175-6783.20192039497	*Mycobacterium leprae* infection in a medium endemicity municipality	distribution of infection and *Mycobacterium leprae* disease	diagnosed with three years of difference and residents within the 100-meter radius (p=0.010)	was related to the *Mycobacterium leprae* infection, and the spatial analysis showed a hidden endemic scenario.
E23	Chaves *et al.,* 2017 10.5123/S1679-49742017000400012	Social deprivation index and leprosy in Pará State, Brazil, in 2013: spatial analysis	To analyse the ecological association between the condition of social deprivation and leprosy detection rate in Pará State, Brazil	the spatial autocorrelation between LDR and SDI in Pará State was significant (p<0.05) (...) municipalities with high (or low) frequency of social deprivation index, and high (or low) frequency of leprosy cases were spatially associated with other municipalities with the same characteristics (...) municipalities that presented high social deprivation index also presented high leprosy detection rate	There was spatial association between SDI and LDR****, with higher leprosy detection in the municipalities with higher social deprivation.
E24	Cury *et al.,* 2017	Spatial analysis of leprosy incidence and	To identify clusters of the major occurrences of	clusters of high leprosy occurrence were associated with the lowest	The spatial analysis techniques utilized identified the poorer

	10.1590/S0034-89102011005000086	associated socioeconomic factors	leprosy and their associated socioeconomic and demographic factors	socioeconomic level areas and it was revealed that locations where ill people live lack healthcare services. Additionally, there is no association between leprosy incidence and demographic density. The decrease in leprosy prevalence, which was less than 10 cases per 100,000 inhabitants in 2006 and 2007, and in the detection of new cases point to a possible elimination of the disease in the city.	neighbourhoods of the city as the areas with the highest risk for the disease.
E25	Imbiriba *et al.,* 2009 10.1590/S0034-89102009005000046	Social inequality, urban growth and leprosy in Manaus: a spatial approach	To analyze the epidemiology of leprosy according to spatial distribution and living conditions of the population	the utilization of the Bayesian rate as a dependent variable, and the occurrence of leprosy in children under 15 and the ICS as independent variables showed that the chances of leprosy cases in a certain census tract increase in	Spatial analysis of leprosy showed that the distribution of the disease is heterogeneous and is more strongly present in regions inhabited by more vulnerable groups.

				proportion to the number of cases in children under 15 and to the worsening of living conditions of the population	
E26	Chagas *et al.,* 2021 10.47878/hi.2021.v46.37428	Sociodemographic, clinical and geospatial profile of new leprosy cases diagnosed at Lauro de Souza Lima Institute, Bauru, São Paulo, between 2015 and 2019	To investigate the sociodemographic, clinical and geospatial profile of new leprosy cases diagnosed between the years 2015 to 2019 in Lauro de Souza Lima Institute (ILSL), a reference center in leprosy located in Bauru, interior of the state of São Paulo	these patients were residents of the northwest region of the municipality, where the largest number of neighbourhoods with high and very high social vulnerability are concentrated.	People affected by leprosy travel long distances at national and state levels, which contributes to late diagnosis and to existing physical disabilities
E27	Borbosa *et al.,* 2020 10.1590/S1678-9946202062093	Spatial analysis of epidemiological and quality indicators of health services for	To describe new leprosy cases using the operational classification and analyze spatial patterns using	it is worth noting that Regions I, IV and IX had the worst percentages of population coverage estimated by the Family Health team, and this	The overall detection rate showed three high-priority areas; the indicator rate of grade 2 physical disability revealed

		leprosy in hyperendemic areas in Northeastern Brazil	epidemiological and quality indicators of health services in hyperendemic areas in Northeastern Brazil.	may have jeopardized the timely diagnosis in these locations.	clusters in regions IV, V, and VI; and the indicator rate of cases with some degree of disability showed precarious municipalities in seven health regions.
E28	França *et al.,* 2023 10.47276/lr.94.4.276	Spatial analysis reveals failures in leprosy control activities in a hyperendemic city in Brazil	To analyze leprosy trends in an endemic Brazilian municipality (Mossoró) and the distribution patterns of cases diagnosed with Grade 2 disability (G2D), considering their relationship with the basic health units in the urban area	a correspondence could be observed between the concentration in absolute numbers of G2D cases and the health units with less efficiency in carrying out early diagnosis.	The concentration of G2D cases took place in regions previously known as leprosy clusters in the urban area and many of those cases lived very close to the BHUs, meaning that surveillance activities for leprosy have been inadequately conducted.
E29	Dias *et al.,* 2007 10.47276/lr.78.3.261	The use of Geographical Information System	To use geo-referencing data to define strategies to combat the disease in the	strategies to carry out directed case-finding campaigns	The use of GIS, linked to strategies to carry out directed case-finding campaigns, has

		(GIS) to improve active leprosy case finding campaigns in the Municipality of Mossoró, Rio Grande do Norte State, Brazil	municipality of Mossoro´/RN and select the most appropriate areas for active case-finding campaigns to be carried out		proven effective and inexpensive in the fight against leprosy in the municipality of Mossoró
E30	Rodrigues-Júnior *et al.,* 2008 10.1590/s0034-89102008000600006	Spatial and temporal study of leprosy in the state of São Paulo (Southeastern Brazil), 2004-2006	To assess the temporal evolution of leprosy detection in the state of São Paulo, between 2004 and 2006	there was positive correlation between the leprosy detection coefficients and the average scores of the “schooling” and “longevity” IPRS components, and negative correlation between the leprosy detection coefficients and the average scores of the “wealth” component of IPRS.	The result of the time series analysis suggests that the endemy is on the decline in the majority of regions of the state of São Paulo, while the spatial analysis shows that the coefficients are high in the northern part of the state.
E31	Grantz *et al.,* 2018 10.1186/s40249-018-0402-y	Spatial distribution of leprosy in India: an ecological study	To evaluate social and economic factors as predictors of leprosy annual new case detection	illiteracy, scheduled tribe population, and radiance (including the binary low visibility indicator) are all independently significant	Our findings suggest a somewhat higher rate of leprosy detection, on average, in poorer districts; the overall effect is weak

			rates within India, where the majority of leprosy cases occur	predictors of district-level annual new case detection rate (...)	
E32*	Amaral *et al.,* 2020 10.21675/2357-707X.2020.v11.n3.3478	Epidemiological and spatial aspects of school children in National Leprosy Campaign in Sobral – Ceará, Brazil	To evaluate social and economic factors as predictors of leprosy annual new case detection rates within India, where the majority of leprosy cases occur	it was found that schoolchildren who had spots on their bodies kept close distances to school children who had cases of leprosy in the family, with the minimum distance being close to zero kilometres. near zero kilometres.	There was a prevalence of spots in male students living in the urban area, with a minimum spatial distance (up to 10 km) of students with spots for cases with leprosy in the family.
E33	Machado *et al.*, 2022 10.1186/s40249-022-00943-7	Spatio-temporal analysis of leprosy risks in a municipality in the state of Mato Grosso-Brazilian Amazon: results from the leprosy	To analyse changes in the spatial and temporal distribution of leprosy index cases (IC), co-prevalent cases among contacts of leprosy patients (CP), and the factors associated with the occurrence of the disease	low-risk areas, identified by purely spatial scan, overlap with a homogeneous area in the city presenting the low values of the factor 'poverty' (Additional file 3). (...) The spatial analyses revealed priority areas for interventions, and highlighted poverty as a risk factor for leprosy at census tract level in	The disease distribution was partly explained by poverty indicators. LPEP influenced the spatial dynamic of the disease and results highlighted the relevance of systematic contact surveillance for leprosy elimination.

		post-exposure prophylaxis program in Brazil	during the implementation of the LPEP program in Alta Floresta-MT, Brazil	the urban area of Alta Floresta. Hence, we conclude that poverty is an important factor to identify critical areas for leprosy surveillance. The sustained hyperendemicity in the study site also suggests that innovative strategies should be encouraged to achieve greater effectiveness of leprosy control interventions.	
E34	Ferreira *et al.,* 2019a 10.26633/RPSP.2019.87	Mortality from leprosy in highly endemic contexts: integrated temporal-spatial analysis in Brazil	To describe temporal trends and spatial patterns of leprosy-related mortality in the North and Northeast of Brazil from 2001 to 2017	for very high SVI values, the tendency was to increase	Leprosy mortality in the Brazilian North and Northeast is expressive and persistent, with a focal pattern of distribution in more vulnerable territories and populations.
E35	Lapa *et al.,* 2001	Leprosy surveillance in Olinda, Brazil, using	To analyse the concept of collective risk by defining homogeneous micro-areas	the results of the study indicate that the heterogeneous spatial distribution of leprosy in Olinda is	The same procedure was repeated using the income variable only. When the

	10.1590/S0102-311X2001000500016	spatial analysis techniques	using the social deprivation indicator. the social deprivation indicator, verifying its coherence with leprosy distribution patterns obtained from the SINAN database for the Municipality of Olinda in the period 1991-96	not random, identifying a pattern of aggregation in space that is associated with the living conditions of the population and is expressed through the social deprivation indicator - calculated from scores relating to socio-economic variables from the demographic census - or expressed only through the income variable.	association was tested between the mean SDI value and the mean leprosy detection rate for the period 1991-1996, the value obtained for r^2 was 66.1% in the multiplicative model, increasing to 84.3% when the income variable was used

* Portuguese papers

Supplementary Table 2. Article search strategies used to carry out review on factors associated with the spatial distribution of leprosy.

	Doi or PMID
SCOPUS ***Articles include in this review***	(PMID (24745125 OR 18035777) OR DOI ("10.1186/1476-072X-7-40" OR "10.4081/gh.2006.285" OR "10.1371/journal.pntd.0002093" OR "10.21675/2357-707X.2020.v11.n3.3478" OR "10.1136/bmjopen-2018-

	023420" OR "10.1590/s0034-89102001000500011" OR "10.1590/0102-311x00197216" OR "10.1016/j.ijid.2021.05.014" OR "10.4269/ajtmh.2010.08-0675" OR "10.1590/0037-8682-0307-2015" OR "10.5935/1415-2762.20170007" OR "10.1016/j.jiph.2019.08.006" OR "10.4081/gh.2023.1227" OR "10.1590/1980-549720200007" OR "10.1111/tmi.13343" OR "10.26633/RPSP.2019.87" OR "10.47878/hi.2021.v46.37428" OR "10.15253/2175-6783.20192039497" OR "10.5123/S1679-49742017000400012" OR "10.1371/journal.pntd.0006407" OR "10.1590/s0034-89102009005000046" OR "10.26848/rbgf.v14.3.p1513-1529" OR "10.1590/S1678-9946202062093" OR "10.1590/S0034-89102012000100014" OR "10.47276/lr.94.4.276" OR "10.1590/s0034-89102008000600006" OR "10.1186/s40249-018-0402-y" OR "10.1590/abd1806-4841.20197554" OR "10.1590/1413-81232020258.21522018" OR

	"10.1186/s40249-022-00943-7" OR "10.47878/hi.2004.v29.35243" OR "10.1590/S0034-71672008000700008" OR "10.1590/S0102-311X2001000500016"))
SCOPUS ***Articles on leprosy***	**Free vocabulary**
	(Leprosy OR Hanseníase OR Lepra OR "Doença de Hansen" OR "Hansen Disease" OR "Hansens Disease" OR "Mycobacterium leprae" OR "Mycobacterium leprae" OR "Bacilo da Hanseníase" OR "Bacilo de Hansen")

Supplementary Table 3. Presentation of the main quantitative methodological information on the 35 study articles on leprosy.

Selected reference	Country and study period	Source data	Main objectives for the use of geographical information systems (GIS)	Epidemiological measure	Number of cases per related inhabitants	Geospatial method	Type of variable

Argaw *et al.*, 2006	Ethiopia 2001 to 2003	Ministry of Health	Assess the impact of environmental factors on the prevalence	Prevalence *	0-0.1, 0.1-0.7 and >0.7cases/10,000	Ecologic niche-modelling	EVM
Amaral & Lana, 2008	Brazil 1998 to 2006	SINAN + IBGE + SIM	To examine the relationship between the epidemiological situation and the socioeconomic indicators of the region	Coefficient	5,7 / 10,000	Moran's *I*	HI
Souza *et al.*, 2001	Brazil 1993 to 1997	SINAN + IBGE	To identify areas with potential underreporting of cases or a high risk of transmission using an ecological approach	Coefficient	4,3 / 10,000	Empirical Bayesian model Neighbourhood matrix	HI
Santos *et al.*, 2019	Brazil 2002 to 2015	SINAN + IBGE	Describe the clinical and epidemiological indicators, temporal trends, and spatial distribution	Incidence	2002: 6.29/ 100,000 2015: 3.78/ 100,000	KD, Global Moran.s *I* Local Moran.s *I*	HI
Rodrigues *et al.*, 2017	Brazil 2004 to 2013	SINAN	To analyse the relationship between the disease's epidemiological profile and the HVI	Incidence	3.44 / 100,000	Global Moran's *I*	HI

Franca *et al.*, 2023	Brazil 2009 to 2018	SINAN	To investigate clusters and distribution patterns and their spatial relationship with primary health units	Incidence		KD, Voronoi diagram	HI
Dias *et al.*, 2007	Brazil 1998 to 2002	SINAN + registration of the municipal health administration	To enhance active case-finding campaigns in the municipality	Coefficient	2004: 5.16/ 10,000 2005: 9.34/ 10,000	Density map	HI
Borba *et al.*, 2021	Brazil 2017	SINAN + IBGE	To identify socio-environmental risks and vulnerabilities	Incidence		Global Moran's *I* Generalised Linear Models	HI + SOC
Souza *et al.*, 2020b	Brazil 2001 to 2015	SINAN + IBGE	To analyse the association between the social needs and the detection of new cases in the population	Coefficient	Pilão Arcado**: 65.38 / 100,000 Barra**: 64.49/ 100,000 Buritirama**: 48.96/ 100,000	Empirical Bayesian model Global Moran's *I* Local Moran's *I*	HI + SOC

Duarte-Cunha *et al.*, 2016	Brazil 1998 to 2006	SINAN + Municipal Health Secretariat	To discuss the application of GWR to health data, specifically in the context of leprosy epidemiology	Incidence	3.61/ 10,000	Geographic weighted regression Moran's *I*	HI + SOC
Sousa *et al.*, 2020	Brazil 2015	SINAN	To analyse the spatial pattern of cases and their household contacts within the sanitary districts	Coefficient	General: 67.29/ 100,000 Itaqui-Bacanga**: 73.05/ 100,000 Tiririca** 67.94/ 100,000 Coroadinho**: 60.86/ 100,000	KD	HI + SOC
Ortuño-Gutiérrez *et al.*, 2021	Comoros/ Madagascar 2021	Baseline survey of the PEOPLE trial	To assess patterns of spatial case clustering at the household and individual levels, with the aim of informing case-finding strategies	Prevalence *	0.0 to 30.8/ 1,000 Median: 2.5/ 1,000	Kulldorff's spatial scan Distance matrix module in QGIS	LOG
Ribeiro *et al.*, 2019	Brazil 2001 to 2014, 2016	SINAN	Collection of socioeconomic, demographic, housing, and living condition data, along with the clinical case history or contact	Coefficient	0 to 40 / 100,000	Global Moran's *I* Local Moran's *I* Kulldorff spatial scan Knox's local	LOG

Amaral *et al.*, 2020	Brazil 2018	National campaign data + SINAN + IBGE	To describe the epidemiological aspects of public-school students aged five to fourteen who participated in the national leprosy campaign	Coefficient		Voronoi Diagram Linear distance and proximity matrix	LOG
Joshua *et al.*, 2008	India 1991 to 2003	Earlier surveys	To examine the variation in prevalence and explore potential factors that may have influenced these variations in the study area	Prevalence *		MCMC, Simulation, Bayesian models	SOC
Souza *et al.*, 2019	Brazil 2001 to 2015	SINAN + IBGE	To analyse the association between the disease occurrence and synthetic indicators of municipal socioeconomic performance, social vulnerability and income inequalities	Coefficient	0 to 270.8 / 100,000	Global Moran's *I* Local Moran's *I*	SOC
Mencaroni *et al.*, 2004	Brazil 1997 to 2002	SINAN + IBGE	To discuss its relationship with the living conditions of the population	Coefficient	18,47/ 10,000		SOC

Souza *et al.*, 2020a	Brazil 2001 to 2015	SINAN + IBGE	To analyse the spatial case distribution in the State of Bahia and its relationship with socioeconomic indicators	Coefficient	19,98/ 100,000	Empirical Bayesian model Global Moran's *I* Local Moran's *I*	SOC
Marciano *et al.*, 2018	Brazil 2000 to 2010	Records of leprosy and TB referral services	To analyse the spatial behaviour of leprosy and explore the relationship between the clinical and epidemiological aspects of the disease.	Coefficient	**2000-2005** Annual detection rate MB: 43.1/ 100,000 Overall detection rate PB: 57.7/ 100,000 Annual detection rate <15 years: 5.4/ 100,000 **2006-2010** Annual detection rate MB: 36.2/ 100,000 Overall detection rate PB: 27.7/ 100,000	Kulldorff's spatial scan, Moran's *I*	SOC

					Annual detection rate <15 years: 19.5/ 100,000		
Queiroz *et al.*, 2010	Brazil 1995 to 2006	Total list of cases reported	To characterise the geographical disease distribution	Coefficient	0.00 to 31.69 cases per 10,000	KD, Kulldorff's spatial scan, Global spatial autocorrelation	SOC
Moura *et al.,* 2013	Brazil 2006	Municipal Health Office	To identify high-risk areas and assess effectiveness of skin and neurological examinations during household visits in high-prevalence neighbourhoods	Incidence	Household: 2.9/ 100,000 Neighbour: 2.1/ 100,000	MCMC Simulation	SOC
Sampaio *et al.*, 2013	Brazil 2005 to 2009	SINAN + Municipal Health Office + IBGE	To explain the influence of occurrence in the the socio-economic context	Coefficient	8 districts = 40/ 100,000 20 districts = 20 to 39 / 100,000 11 districts = 2 to 9 /100,000	MCMC	SOC
Ferreira *et al.*, 2019b	Brazil 2001 to 2017	SINAN + State Health	To explain the influence of socio-economic factors on disease occurrence considering	Coefficient	**Tocantins North** General population: 83.94/ 100,000	Kulldorff's retrospective statistics	SOC

		Department + IBGE + IPEA	factors, such as income, education, housing conditions and healthcare access.		Children: 23.52/ 100,000 PD2 at diagnostics: 43.45/ 1,000,000 **Maranhão Northeast** General population: 69.05/ 100,000 Children: 21.10/ 100,000 PD2 at diagnostics: 39.56/ 1,000,000	MCMC, Simulation	
Carvalho *et al.*, 2023	Brazil 2011 to 2017	SINAN + IBGE	To explore demographic, socioeconomic and structural characteristics associated with disease distribution	Incidence	**2011-2017:** Average detection: 57.9/ 100,000 **2011-2014:** NCDR: 58.1 e 73.4/ 10,000 **2017:** NCDR: 33.7/ 100,000	Kulldorff's spatial scan, SLM, SEM	SOC
Assis *et al.,* 2018	Brazil 2003 to 2015	SINAN + IBGE	To analyse social determinants and their relationship to risk of infection considering living conditions, access to healthcare and socioeconomic status	Incidence		Bivariate Global Moran's *I*, GWR	SOC

Chaves *et al.*, 2017	Brazil 2013	SINAN + IBGE	To analyse the ecological association between social deprivation and disease	Coefficient	25 of 143 municipalities: ≥40.00/ 100,000 Araguaia of municipalities = 10.00 to 19.99/ 100,000	Global and local bivariate Moran's *I*	SOC
Cury *et al.*, 2012	Brazil 1998 to 2007	IBGE	Aimed at identifying clusters of incidence and analysing the associated socioeconomic and demographic factors	Incidence	**1998-2007** Medium incidence: 104.1/ 100,000 Urban area: 0 - 269.5/ 100,000	Kriging	SOC
Imbiriba *et al.*, 2009	Brazil 1998 to 2004	SINAN + IBGE	To study epidemiological factors based on spatial distribution and its association with living conditions	Coefficient	4.21/ 10,000	Empirical Bayesian method	SOC
Chagas *et al.*, 2021	Brazil 2015 to 2019	medical records	To investigate sociodemographic, clinical and geospatial case characteristics				SOC
Barbosa *et al.*, 2020	Brazil 2005 to 2014	SINAN + IBGE	To analyse spatial patterns using epidemiological data and quality indicators of health services in hyperendemic areas	Coefficient	**2005:** 39.12/ 100,000 **2014:** 27.44/ 100,000	Bayesian local empirical, Moran's *I* - LISA	SOC

Rodrigues-Júnior *et al.*, 2008	Brazil 2004 to 2006	Ministry of Health	To assess the temporal evolution of leprosy detection in the state of São Paulo	Coefficient	Interior and coastal regions of the state: 18.13 and 32.14 / 10,000 Others places: 3.25 e 5.77 / 10,000	Kriging interpolation	SOC
Grantz *et al.*, 2018	India 2008 to 2015	Indian Ministry of Health reports + Centre for Monitoring Indian Economy database	Examine the association between epidemiological outcome variables and poverty	Coefficient	**2008:** 1.06 /10,000 **2015:** 0.929 /10,000	Spatial block bootstrap (1,000 replicates)	SOC
Machado *et al.*, 2022	Brazil 2016 to 2018	Post-Exposure Prophylaxis program + SINAN + IBGE	To examine the factors associated with the disease occurrence during the implementation of a leprosy post-exposure prophylaxis programme	Coefficient	**General Population:** 20.01/ 10,000 **People under 15 years old**: 11.8 cases/ 10,000	Empirical Bayesian KD, Spatial scan	SOC

Ferreira *et al.*, 2019a	Brazil 2001 to 2017	SIM	To provide an integrated description of temporal trends and spatial patterns of mortality associated with leprosy.				SOC
Lapa *et al.*, 2001	Brazil 1991 to 1996	SINAN + FUNASA + Pernambuco Telephone Company	To evaluate the consistency of social deprivation and distribution patterns	Coefficient	**High risk:** 7.57 por 10,000 **Medium risk:** 7.13 por 10,000 **Low risck:** 1.92 por 10,000	Global Moran's *I* K-mean	SOC

SINAN = Brazilian disease notification system; IBGE = Brazilian Institute of Geography and Statistics; FUNASA = Brazilian Health Foundation; SIM = Brazilian Mortality Information System; IPEA = Brazilian Institute for Applied Economic Research NCDR = Rate of new cases; EVM = Environment; HI = Heath indicator; LOG= Logistic; SOC = Socio-demographic; *all cases in the population; **study area; Incidence = only new cases; Coefficients = aggregates rates in general. TB = tuberculosis; LISA = Local Indicators of Spatial Association; KD = Kernel density; HVI = Health Vulnerability Index; GWR = geographic weighted regression; SLM = spatial lag model; SEM = spatial error model; MCMC = Markov Chain Monte Carlo

Supplementary Table 4. Main examples of the investigated variables that formed the four socio-demographic dimensions associated with the spatial distribution of leprosy.

Dimension	**Article**	**Description**	**Indicator/Index**	**Variable**
1	Souza *et al*., 2019 Borbosa *et al.,* 2020	Development and Inequality Indicators	Municipal Human Development Index (IDHM)	Longevity Education Income
			Income Inequality Indices	Gini Index Theil Index
			Municipal Development Index (IFDM)	Education Heath Employment and income
			Socioeconomic Performance Index (IPESE)	Education Health Economy and finance

2	Ferreira *et al.,* 2019a Ferreira *et al.*, 2019b Chagas *et al.,* 2021 Souza *et al.,* 2020b Mencaroni *et al.,* 2004 Machado *et al.,* 2022 Lapa *et al.,* 2001	Social Vulnerability and Living Conditions Indicators	Social Vulnerability Index (IVS) / Social Deprivation Index	Urban infrastructure Human capital Income and employment
		Income Inequality Indices	Income Inequality Indices	Average income of the household head (in relation to the minimum wage) Collective risk situation
3	Chaves *et al.,* 2017	Infrastructure and	Sanitation conditions	Percent households without piped water

	Assis *et al.,* 2018 Queiroz *et al.,* 2010 Carvalho *et al.,* 2023	Sanitation Indicators		Percent households without regular waste collection Percent households without a sewage system Dumping of waste adjacent to the house
			Urban Quality Index (IQU)	Urban quality of life Social conditions of the inhabitants
			Infrastructure	Percent households with running water in at least one room Percent households with piped sewage system Percent households without a bathroom Percent households with waste discarded in vacant land Percent households without trees in the surrounding area

				Percent households with a septic tank Percent households with open-air sewage
4	Joshua *et al.,* 2008 Moura *et al.*, 2013 Marciano *et al.,* 2018 Queiroz *et al.,* 2010 Carvalho *et al.*, 2023 Assis *et al.*, 2018	Socioeconomic Indicators	Economic and Income Indicators	Percent household heads without formal education Percent household heads with income below minimum wage Percent household heads without income Average income of household heads (male and female) Percent individuals living in extreme poverty Economic status
			Education Indicators	Percent illiterate individuals Percent illiterate women

				Average years of education of the household head Years of schooling
			Demographic Indicators	Population density (inhabitants/km^2) Castes and populations of scheduled tribes, rural population Percent urban population Percent individuals aged 60 years or older Percent individuals aged 15 years or older who are illiterate Number of households with a density greater than three people per bedroom Percent non-white individuals (i.e., black, mixed, indigenous)