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Review Article

Analysis of the spatial distribution of scientific publications regarding vector-borne diseases related to climate variability in South America

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A B S T R A C T

Most vector-borne diseases exhibit a distinct seasonal pattern, which clearly suggests that they are weather sensitive. Rainfall, temperature, and other climate variables affect in many ways both the vectors and the pathogens they transmit. Likewise, climate can be determinant in outbreaks incidence. A growing number of studies have provided evidence indicating the effects of climate variability on vector-borne diseases. However, oftentimes, the different diseases and regions are not uniformly represented, scarcity or lack of publications in some countries is common. The objectives of this work were to analyze the distribution and abundance of publications on vector-borne diseases associated with climate variability in South America, identify those works that conducted a geographic analysis and detect the countries where outbreaks occurred and the climate variables with which they were associated. A systematic review of the literature published on vector-borne diseases linked to climate variability in South America was conducted, identifying, evaluating and summarizing scientific papers. The distribution of the study areas and disease type in the publications were represented on maps. Dengue and leishmaniasis were the most studied and widely represented diseases in South America. The country with the largest number of published papers and presence of all disease types was Brazil. Outbreaks of disease were related to different climate variables. Most diseases from the publications under study occurred in equatorial and tropical climates. The disease represented by the largest number of different types of climates was dengue. The technique used in this work allowed us to determine the status of knowledge of the main diseases associated with climate variability in South America. This methodology could be improved in the future by incorporating other bibliographic sources as well as other diseases related to climate variability.

1. Introduction

The diverse patterns of weather and climate variability in South America include tropical, subtropical and mid-latitude features. South America is crossed by the equatorial line in its extreme north, being the greatest part of its territory comprised in the southern hemisphere. Atmo-

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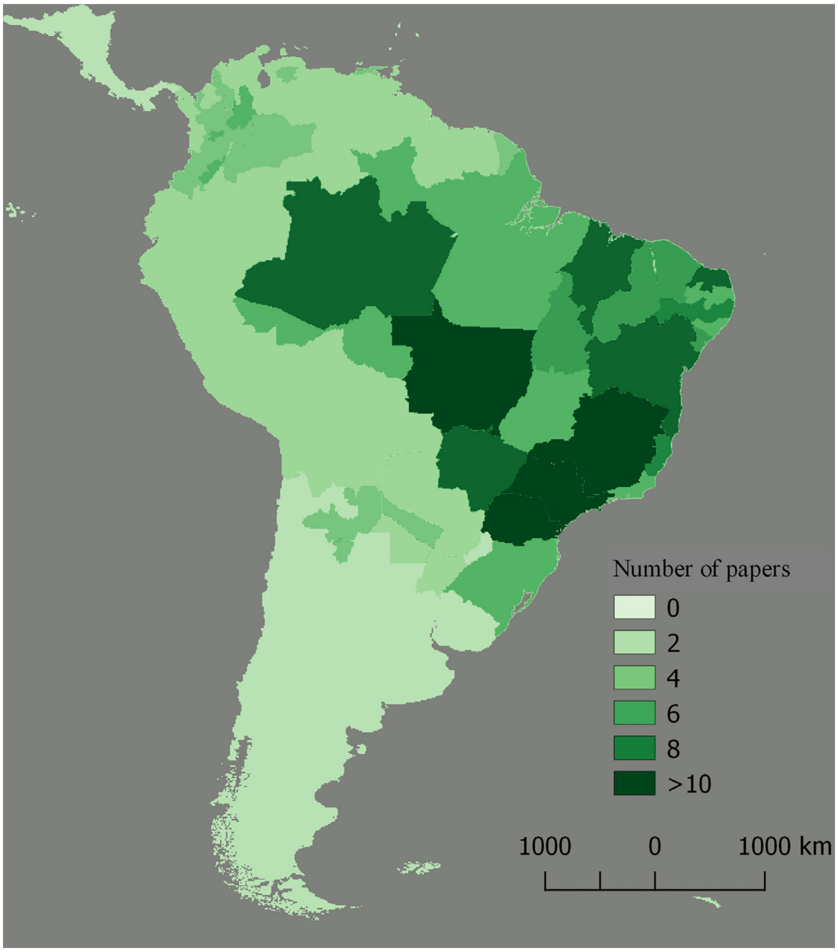

Fig. 1. Geographical distribution and number of scientific papers related to climate and Leishmaniasis.

spheric circulation and precipitation are strongly affected by the topographic features and the vegetation patterns of the continent, as well as by the slowly varying boundary conditions of the adjacent oceans. The El Niño – Southern Oscillation phenomenon is rooted in the ocean-atmosphere system in the tropical Pacific; and has a strong influence on most of the tropical and subtropical South America. Similarly, sea surface temperature anomalies in the Atlantic Ocean play a key part in the climate and weather along the eastern coast of the continent (Garreaud et al., 2009).

The time-evolution of the atmospheric conditions (temperature, rainfall, wind, etc.) in a given region displays non-regular fluctuations across a broad range of superimposed scales on the mean diurnal and annual cycles. These fluctuations include synoptic-scale variability, broadly associated with weather, as well as intra-seasonal, inter-annual, inter decadal and longer-scale variations. These variations arise from the internal variability of the atmosphere, and they are related to other components of the earth system: oceans, land-vegetation, sea-ice, etc. (Garreaud et al., 2009). An analysis of the extremes and total annual rainfall showed that they share the same trend pattern, with a change to wetter conditions in Ecuador and northern Peru and southern Brazil, Paraguay, Uruguay, and northern and central Argentina. A decrease was observed in southern Peru and southern Chile. The observed trend towards wetter conditions in the southwest and drier conditions in the northeast could again be explained by changes in ENSO (Haylock et al., 2006).

Most vector-borne diseases exhibit a distinct seasonal pattern, which clearly suggests that they are weather sensitive (Gubler et al., 2001; Valderrama-Ardila et al., 2010; Mateus and Carrasquilla, 2011; Eastin et al., 2014). Rainfall, temperature, and other climate variables affect in many ways both the vectors and the pathogens they transmit (Gubler et al., 2001; Ferreira, 2014; Rodrigues et al., 2015). For example, these climate variables play a key role on the reproduction, survival and biting rates of the mosquitoes that carry malaria and dengue fever, and temperature affects the life-cycles of the infectious agents themselves (Patz et al., 2012). The probability of transmission may or may not be increased by higher temperatures (Gubler et al., 2001). On the other hand, temperature is related to geographical variables such as altitude and latitude. It has been observed that the geographic areas that may be affected by vector-borne diseases move towards higher alti-

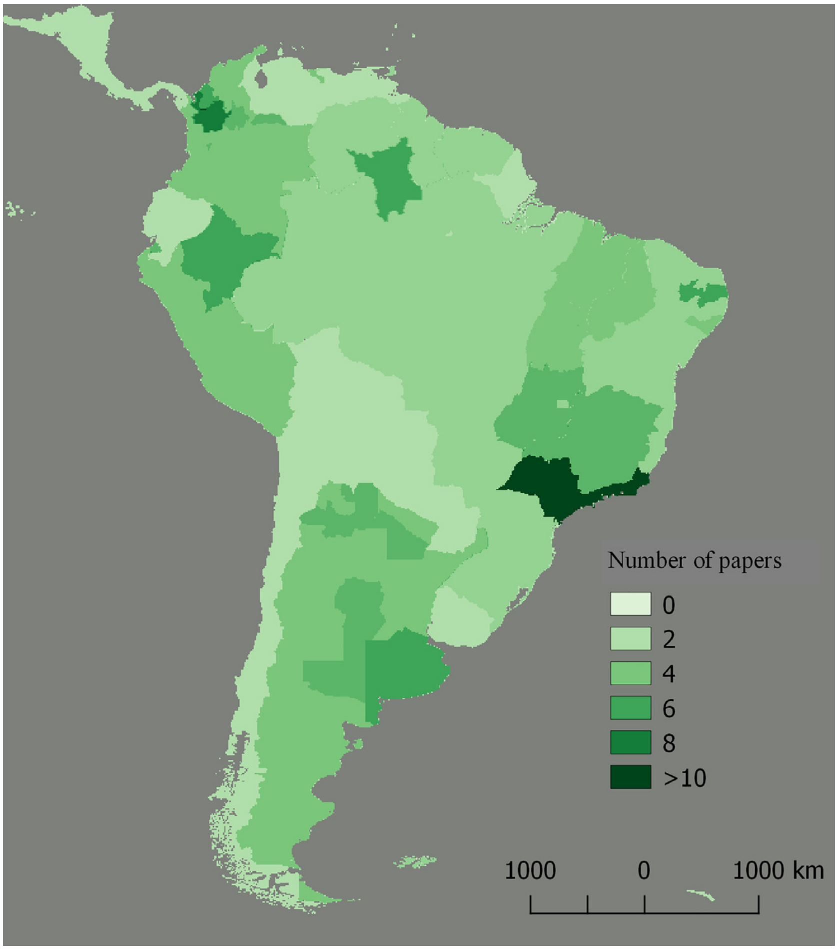

Fig. 2. Geographical distribution and number of scientific papers related to climate and Dengue.

tudes and latitudes, and that transmission times last longer during the course of the year (Epstein et al., 1998; Corvalán, 2007; Ruiz-López et al., 2016). Nonetheless, a recent work has highlighted the relevance of the temperature-dependent traits of mosquitoes and viruses that determine transmission intensity (Mordecai et al., 2017). Therefore, not only the increase in temperature would be influencing the possibility of disease transmission, but also the optimal range to which each species of vector develops, attains fecundity, adults and eggs survival and biting rate (Mordecai et al., 2017). The variability of climate environment affects the incidence rates of vector-borne and zoonotic diseases, and it is likely to be connected to epidemic outbreaks (Patz et al., 2000; Cárdenas et al., 2006; Tourre et al., 2008; Valderrama-Ardila et al., 2010; Mateus and Carrasquilla, 2011, Lowe et al., 2011; Lowe et al., 2012; Lowe et al., 2014). According to Githeko et al., (2000), the most substantive climate-sensitive vector-borne diseases in South America, in terms of number of individuals affected, are malaria, leishmaniasis, dengue fever, chagas disease and schistosomiasis. However, emerging diseases such as zika and chikungunya have played a leading role in recent years in South America (Pyszczek and Sáez, 2016; Faria et al., 2017; Morrison, 2014) and others seem to be influential at a local scale, such as leptospirosis (Miyazato et al., 2013; Mendonça Guimarães et al., 2014). The tremendous growth in international travel has accentuated the risk of importation of vector-borne diseases, some of which can be transmitted locally under suitable conditions at the right time of the year (Gubler et al., 2001).

A growing number of studies have provided evidence of the effects of climate variability on vector-borne diseases. However, oftentimes, the different diseases and regions are not uniformly represented, scarcity or lack of publications in some countries is common. It is necessary to identify those areas where outbreaks occurred and detect the climate variables that caused them. This is not an exhaustive review, since searches were mainly conducted in free bibliographic search engines. Still the intention was to capture reality constrained by methodological limitations. Therefore, the objectives were to: a) analyze the distribution and abundance of publications on vector-borne diseases associated with climate variability in South America, b) detect those works that performed a geographic analysis, c) identify the countries where outbreaks occurred and the climate variables with which they were associated.

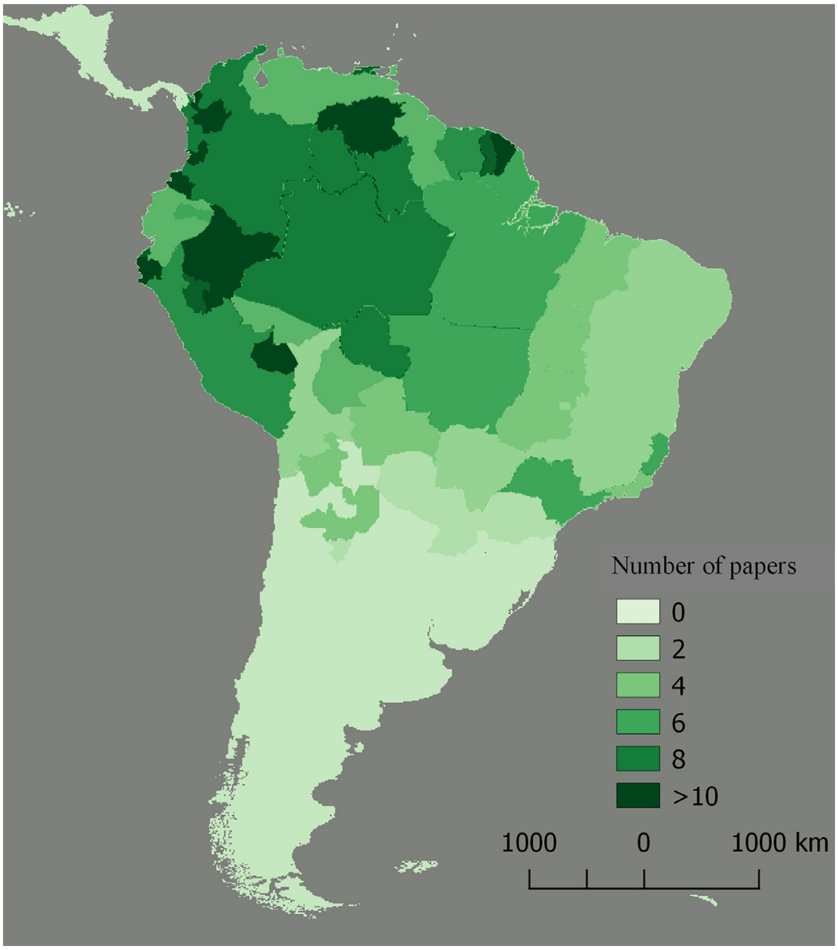

Fig. 3. Geographical distribution and number of scientific papers related to climate and Malaria.

2. Material and methods

2.1. Study area

South America is one of the continents that forms the supercontinent America, also considered by many the southern subcontinent of America. It extends meridionally from 10°N to 60°S, and it is located between the Atlantic Ocean and the Pacific Ocean which border its east and west ends respectively. Its northern limit is defined by the Caribbean Sea and its southern by the Antarctic Ocean. It occupies an area of 18 million km^2, which represents 42% of the American continent and is inhabited by 6% of the world population.

Topographically, South America is divided into three sections: the cordillera, the inland lowlands, and the continental shield. The Andes mountain range is the longest and youngest mountain range in the world, as well as the highest mountain range after the Himalayas. The Andes are born in the deep ocean, and extend from the southeast of the archipelago of Tierra del Fuego, following a line parallel to the Pacific coast. It diversifies in the north, opening in two arms, one towards the Isthmus of Panama and another bordering the Caribbean coast. It passes through Argentina, Chile, Bolivia, Peru, Ecuador, Colombia and Venezuela. The lowlands are usually classified into three systems: the plains of the Orinoco, the Amazon plain and the Chaco-pampeana or Plata plains, formed by the sediments from the rivers that cross them. There are three hydrographical basins of great importance formed by the Amazonas, Orinoco and Paraná rivers. The rivers that flow into the Atlantic Ocean are long, flowing and torrential, while those that empty into the Pacific Ocean are short and torrential as, in their journey from the Andes to the ocean, they cross different heights. The continental shield is divided into three unequal sections: the Brasilia massif, the Guayanés massif, and the Patagonian massif. On the other hand, deserts and arid regions also shape the landscape of South America, such as the Atacama desert in northern Chile and northeastern Brazil.

This subcontinent presents features of tropical, subtropical, and extratropical weather and climate with a strong meridional interaction between the tropics and the extratropics. The surrounding oceans, the Andes mountains

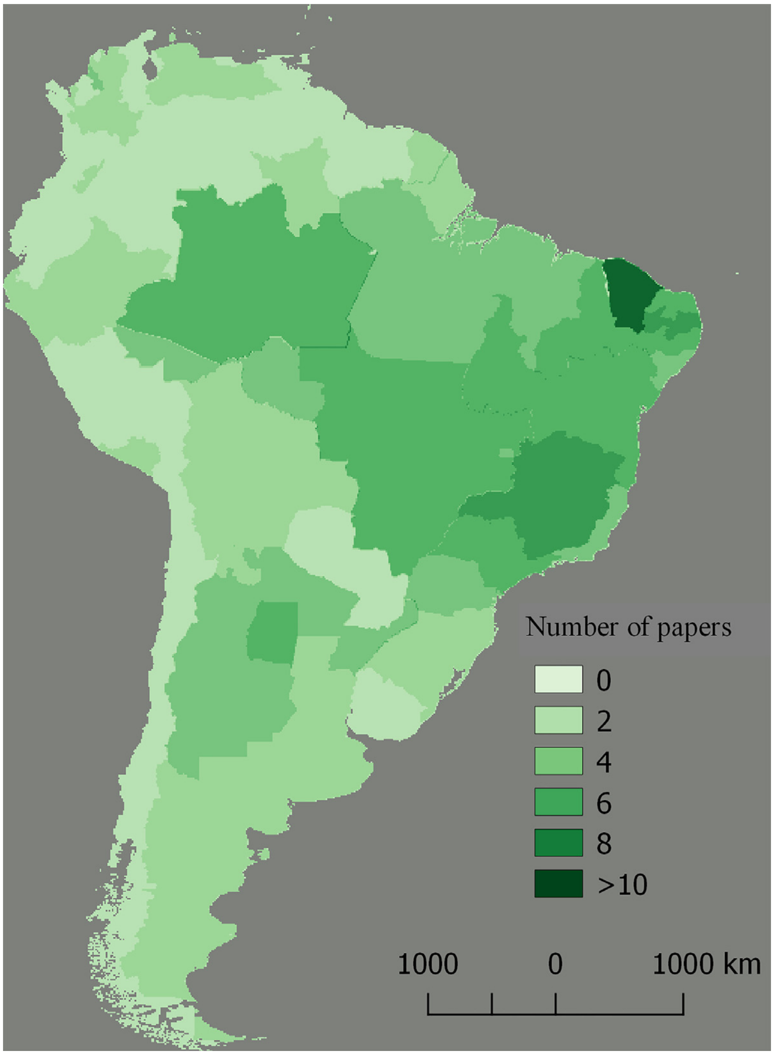

Fig. 4. Geographical distribution and number of scientific papers related to climate and Chagas.

and the Amazon basin influence the continent climatology. The meteorological systems moving across the continent, east of the Andes, cause rain and significant temperature drop. The orography also modifies the trajectory and magnitude of these transient systems coming from the South Pacific Ocean. Due to significant east–west asymmetries across the continent caused by the presence of these mountains, wet (dry) conditions are found to the west (east) of the Andes. From the tropical Atlantic Ocean to the Amazon basin, and then southward toward the extratropics the moisture is transported westward in South America. The availability of moisture, combined with the great latitudinal extension and the varied forms of topographical features of the continent, contribute to define 8 regimes of precipitation. The climate of South America presents a large spatio-temporal variability that is explained by factors related to the general circulation of the atmosphere (trade winds, subtropical anticyclones, etc.), as well as by meteorological systems of smaller spatial scale (cold fronts, extratropical cyclones, sea-land breeze circulation, among others) that interact with the local characteristics of the continent (topography, land cover, etc.).

But in addition to those characteristics about local and regional effects, there are also remote influences. The Atlantic, Pacific and Indian Oceans interact through oceanic and atmospheric teleconnections. Sea surface temperatures anomalies in the tropical regions of the Pacific and Atlantic Oceans can induce anomalies in the amount of rainfall in the tropics. Through this mechanism known in the literature as teleconnections, the variability of the rainfall regime of South America is influenced by phenomena such as El Niño Southern Oscillation, the Indian Ocean Dipole and the variability of the Tropical North Atlantic Ocean, as well as the Madden Julian Oscillation, the Southern Annular Mode and the Pacific-South American Mode. In view of this, the meteorological system in the continent is also influenced by the teleconnection with remote large-scale atmospheric patterns.

2.2. Study design and search strategy

This study aimed to collect scientific evidence on vector-borne diseases related to climate variability in South America, mainly from free bibliographic search engines. A systematic review of the literature published was conducted, identifying, evaluating and summarizing scientific papers in Scielo (http://www.scielo.org), PubMed (http://www.ncbi.nlm.nih.gov/pubmed/advanced), Lilacs (http://bases.bireme.br), Google Scholar and Scopus (https://www.scopus.com). The identification of the scientific publications in the databases was conducted in 2016.

Searches were done in electronic databases through keywords either in Spanish or English. Vector-borne diseases of relevance in South America were analyzed. According to Githeko et al., (2000), the most important climate-sensitive vector-borne diseases in South America, in terms of number of individuals affected, are malaria, leishmaniasis, dengue fever, chagas disease and schistosomiasis. Therefore, focus was on these diseases. However, Zika and Chikungunya were also included due to their incidence in recent years in the region. Leptospirosis was also included due to its substantial presence in a large number of publications as well as its relationship with rainfall and floods, becoming one of the most sensitive diseases to climate variability. Table 1 sets out in detail the Transmission modes and the symptoms of each disease. The term "outbreak" is used to refer to a sudden appearance or increase in the number of cases of an infectious disease in a given place. The first search included terms such as: “vector-borne diseases” and “South America” or “vector-borne diseases” and the name of each of the countries that make up South America. Then the literature search was performed including the name of these diseases combined with other terms, such as: temperature, rainfall, humidity, river, summer, winter, seasonal, meteorological variables, climate factors, El Niño, La Niña, and ENSO.

2.3. Selection and analysis of publications

The scientific papers selected were those dealing with the above-mentioned diseases and their relationship with climate variables such as rainfall, temperature, humidity, hydrometric level and climatic events such as flood and ENSO (El Niño Southern Oscillation). The geographic variable altitude was also included, as elevation affects temperature due to the effect of the atmospheric heat vertical gradient. The manuscripts analyzed explored the relationship between vector-borne diseases and climate variables as their primary or secondary objective. Papers written in English, Spanish and Portuguese and published during 1970–2016 were included. All the selected works specified the study area which was later mapped to analyze the distribution. We analyzed those works published in scientific journals that could be downloaded free of charge from the search engines mentioned above. Only in those cases in which there was no literature available for any particular country, official reports or reviews were consulted. The experimental works, doctoral theses and/or other literature reviews were not taken into account in the review.

A database encompassing the publications and the following information was built: authors and publication year, journal name, publication title, country studied, scale of the study area (city/area, state/province, country, South America, world), studies with spatial and temporal methods, climate (precipitation, temperature, etc.) / geographic variables (altitude, latitude), biological variable (abundance vector, eggs density, number of cases, etc.), relationship with the variable or used method (positive significant, positive qualitative, non-significant, etc.). The states and provinces correspond to the same geographical scale according to the country of reference. The diseases, together with their relationship with climate variables, are shown in tables and weighed based on the number of research works that studied them. The distributions of the study area and disease types of the publications were represented on maps. The maps show the study total abundance by geographic region, the minimum spatial unit being a province or a state depending on the country concerned. The maps were built using raster layers with QGIS and TerrSet software. Each layer represents the study area of a give publication. Therefore overlapping layers/publications resulted in the total number of papers per unit area in South America. Once the geographical distribution of the scientific papers was completed for each disease and its vectors, the information was contrasted with published data (WHO, 2016; OIE, 2016) to detect areas with scarce or no publications. Likewise, the most prevalent types of climates were determined following Köppen climate classification, one of the most widely used climate classification systems.

3. Results and discussion

3.1. Publications reviewed

The literature review comprised 239 scientific works that met the inclusion criteria (Appendix). All countries in South America submitted scientific papers, except for Chile. This does not mean that there are no cases of these diseases in that country, but that there were no papers dealing with climate variability. The country with the largest number of published papers and presence of all types of diseases was Brazil (56%), followed by Colombia (12%) and Argentina (11%). The diseases and/or vectors most largely studied were: leishmaniasis, dengue and malaria, with 31%, 30% and 20% of all publications, respectively. No studies associated chikungunya or zika with the climate variability of the region. This is probably due to recent outbreaks of these diseases in the Americas in 2013 and 2014, respectively (Vargas, 2016). Some papers associate them with climate change (Gorodner, 2016; López-Latorre and Neira, 2016). The climate variables most studied in relation to the diseases were precipitation and temperature (Table 2). Vectors belong to *Aedes, Anopheles, Biomphalaria, Brumptomyia, Eratyrus, Lutzomyia, Nyssomyia, Pintomyia, Rhodnius,* and *Triatoma* genera. Regarding temporal evolution, most papers (72%) were published from 2006 to the present.

The relationship between disease and climate variables was analyzed in the studies using different methodologies such as correlations, comparisons between areas, different

Table 1
Transmission mode, pathogens, symptoms and wildlife hosts/reservoirs of each pathogen.

Disease	Pathogen	Transmission mode	Symptoms	Hosts/reservoirs
Malaria	*Plasmodium falciparum P. vivax P. ovale P. malariae*	- Through the bite of an infective female of *Anopheles* mosquito - Vertical transmission from mother to fetus - Organ transplantation and blood transfusion	Chills, fever and sweat	Wild mammals (e.g., primates, rodents, bats, chickens, ungulates) Birds
Leishmaniasis	Protozoan parasites of the genus *Leishmania*	Through the bite of female phlebotomine sand flies	Symptoms vary depending on the type of leishmaniasis and may include skin sores and spleen enlargement	Mammals (e.g., domestic dogs and rodents) Marsupials (weasels)
Dengue fever	Dengue viruses, which belong to the genus Flavivirus (DEN-1, DEN-2, DEN-3, DEN-4)	Through the bite of an infective *Aedes* mosquito	Sudden high fever, greater than 38 °C, dehydration, intense pain of muscles, joints, bones, head, with eye movement. Bleeding gums, nose, skin and blood in urine or feces may be present. Rash on trunk, arms and legs. Sometimes nausea, vomiting and diarrhea are present too. Dengue hemorrhagic fever: profuse bleeding and shock, which can lead to death	Mammals (primates)
Chagas	*Trypanosoma cruzi parasite*	-Vectorial (transmitted through infected feces of Hemiptera belonging to the subfamily Triatominae) -Vertical transmission from mother to fetus - Organ transplantation and blood transfusion	-Mild: inflation and fever -Acute: congestive heart failure.	-Domestic animals -Birds -Marsupials
Schistosomiasis	Schistosoma is a genus of trematodes, commonly known as blood-flukes	The infection is acquired when the skin comes into contact with water contaminated with parasites	Rash, itching, fever, chills, cough and headache, belly, joint and muscle pain.	Aquatic rodents
Zika	Virus of the Flavivirus genus	- Through the bite of an infective *Aedes* mosquito. -Sexual transmission	Fever, rash, joint pain and red eyes	
Chikungunya	Chikungunya virus belonging to the Togaviridae family of genus Alphavirus	- Through the bite of an infective female mosquito *Aedes aegypti* and *Aedes albopictus*	High fever with sudden onset, generalized muscle and joint pain, rash, nausea, headache. Rare complications, if any, are usually ocular, cardiac, neurological or digestive.	- Squirrels, -Rodents -Birds
Leptospirosis	Leptospiraceae classified as a family belonging to the order Spirochaetale		Fever, headache, chills, vomiting, jaundice, anemia and sometimes rash.	Domestic animals and a wide variety of wild animals

Table 2
Number of publications per disease type and climate variable, and total number of publications per disease. *Le:* Leishmaniasis, *De*: Dengue, *Ma*: Malaria, *Ch*: Chagas, *Lep*: Leptospirosis, *Sch*: Schistosomiasis.

Disease/Variables	Le	De	Ma	Ch	Lep	Sch
Temperature	45	55	17	16	3	5
Rainfall	49	45	30	10	11	9
Humidity	25	12	4	2	1	1
Wind speed	2	3	1	0	1	0
Photoperiod	0	1	0	0	0	0
Vapor pressure	0	3	0	0	0	0
Wind	0	1	0	0	0	0
Hydrometric level	3	0	6	0	0	0
Floods	1	0	2	0	7	2
Stations (dry/wet)	4	1	9	0	1	0
Seasons (spring/summer/autumn/winter)	6	2	1	2	0	0
El Niño, La Niña, ENSO	5	5	7	0	0	0
Altitude	1	4	2	3	0	0
Total publications per disease type	70	70	48	19	15	10

Data were drawn from the bibliographic review carried out in this work between 1970 and 2016.

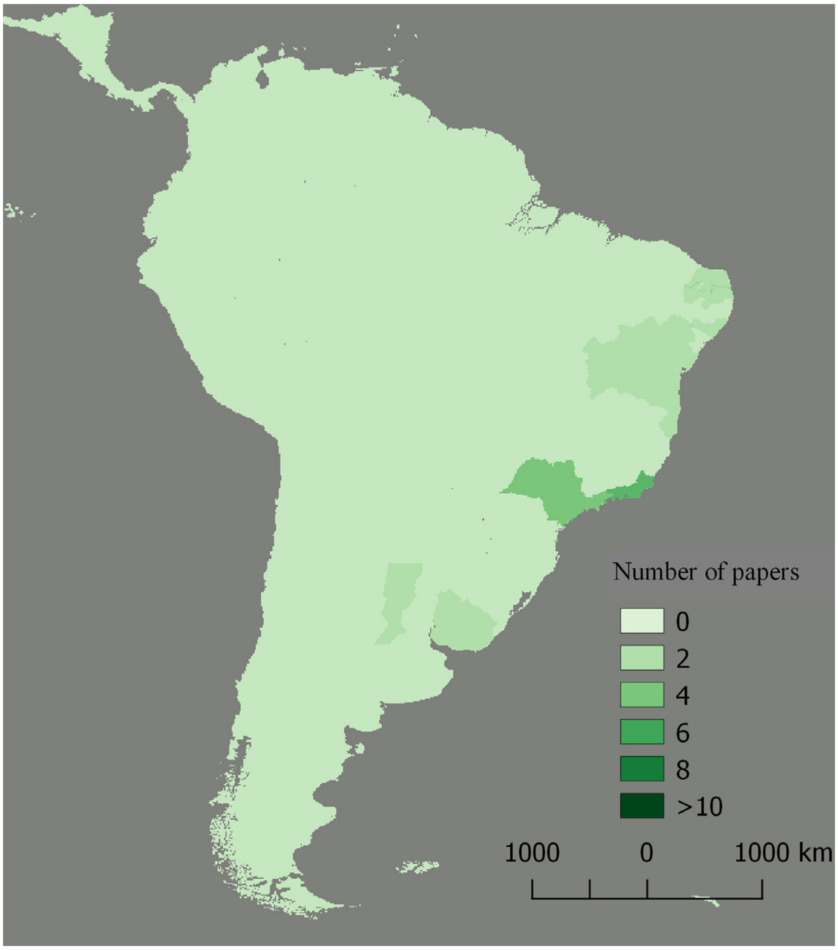

Fig. 5. Geographical distribution and number of scientific papers related to climate and Leptospirosis.

kinds of modeling, multivariate analysis, and descriptive analysis. The Appendix shows, in the most accurate manner, the existing relationships (significant, non-significant, positive, negative, explanatory variables, etc.). Some works considered the delay in the influence of certain climate variables such as rainfall or river level on the incidence of a disease (e.g., Dantur Juri et al., 2009; Stefani et al., 2011; Basurko et al., 2011).

Most papers present annual time scales and include, to a lesser extent, the intra-seasonal variation of the diseases or the biological variables studied in their vectors. Variations between years were mainly related to climate variables such as the presence of El Niño (Gagnon et al., 2001; Eastin et al., 2014) or an increase in precipitation, temperature (Stewart-Ibarra and Lowe, 2013; Stewart-Ibarra et al., 2014) or floods (da Silva Ramos et al., 1970; Vanasco et al., 2000; Barbosa et al., 2001). Most of the diseases or biological variables studied in their vectors accounted for seasonal variations associated with temperature or rainfall in the case of dengue (Vezzani et al., 2004; Gimenez et al., 2015), leishmaniasis (Teodoro et al., 1993; Córdoba Lanus and Solomon, 2002), and malaria (Rozendaal, 1990; Macário Rebêlo et al., 1997). As far as chagas is concerned, seasonality was less accurate. To set an example, Pizarro Novoa and Romaña, (1998) did not find any seasonal difference in the density of *Rhodnius pallescens* in the palm groves of the Caribbean coast of Colombia. The authors then concluded that other variables such as the accessibility of insects to food sources and the variation of the mesological typology where palm trees grow could influence seasonality and should be further studied. Likewise, regarding *Triatoma brasiliensis,* Lorenzo et al., (2000) concluded that thermal variation was greatly dampened inside both domiciliary refuges and the most protected internal places in wild stony sites. For relative humidity, they observed a similar dampening pattern, but mean relative humidity was lower in both domiciliary and refuges and wild ones inside stony sites as compared to reference levels in the surrounding environment.

When analyzing the works dealing with the most studied diseases (leishmaniasis, dengue and malaria), it can be noted that most studies reveal a positive and, in some case, a statistically significant association between the number of disease cases and/or different biological variables (vectors abundance, frequency, persistence and mortality, among others) and precipitation and/or temperature (e.g., Lima et al., 2008; Cortés and Fernández, 2008; Zeidler et al., 2008; Souza et al., 2010; Silva et al., 2012; Jeraldo et

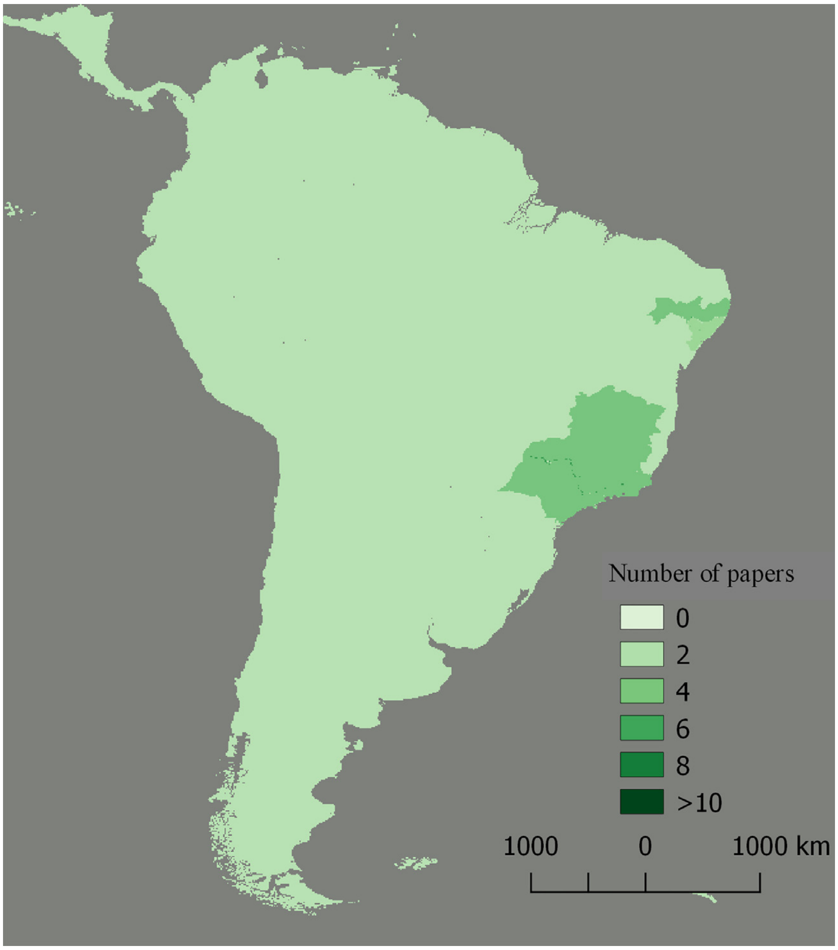

Fig. 6. Geographical distribution and number of scientific papers related to climate and Schistosomiasis.

al., 2012; Ferreira, 2014; Rodrigues et al., 2015). Notwithstanding this, some studies found no relationship between these variables (e.g., Ribeiro et al., 2006; Cassab et al., 2011; Ferro et al., 2011). As regards leishmaniasis, Ferro et al., (2011) showed that periods of lower rainfall were inversely associated with abundance peaks of *Lutzomyia longiflocosa* and L. *columbiana*. Additionally, higher prevalence of phlebotomine infection was recorded in the periods with higher vector abundance. These results suggest that transmission risk may be linked to human domestic areas and that risk would increase during the periods of highest abundance of phlebotomine activity.

Most of the studies reviewed reveal a positive association between precipitation, temperature and humidity and dengue incidence (Rúa Uribe et al., 2012; Flamand et al., 2014; Moura Rodrigues et al., 2015), eggs abundance, larvae and adult vectors (Souza-Santos, 1999; Micieli et al., 2006; Steward-Ibarra and Lowe, 2013; Estallo et al., 2015) and the presence of larvae of A. aegypti with the El Niño phenomenon (Steward-Ibarra and Lowe, 2013). Nonetheless, some papers conclude that there is no relationship with climate variables. For instance, Ferreira da Rocha Taranto et al., (2015) found no association between rainfall and number of eggs. These authors explain that extreme rainfall conditions are not associated with vector presence over time, as the relationship between vector presence and rainfall is best described by a polynomial curve. This pattern may result from the elimination of larvae from overflowing containers. Rosa-Freitas et al., (2006) suggest that in Boa Vista (Brazil) antecedent climate conditions have a differential impact on dengue over the course of the year. Minimum temperature and relative humidity are important in the early year. In spite of this, these two factors are much less significant in the mid-year period, and change once again for the late year. Short-term climate and vector biology/behavior may vary from one season to another. Therefore, particular climate conditions promoting dengue in one portion of the year may either be non-existent or irrelevant during other parts of the year. Limiting analysis to separate parts of the year with distinctive antecedent climate regimes makes it possible to determine the impact of period-specific elements of climate. They illustrate the importance of focusing the analysis on short, relevant time periods. Ribeiro et al., (2006) remarked that the correlation with temperature and average monthly precipitation with cases of dengue was noticed when the values of the abiotic factors of a given month were considered with the number of cases of the following month. Therefore, there would be a lag or mismatch between climate variables and the appearance of dengue cases. According to Cassab et al., (2011) dengue transmission showed associations when climate variables were analyzed together and not individually.

Most of the studies associate the highest incidence of malaria and abundance of its vectors with a decrease in precipitation or with the dry season (e.g., Berti-Moser et al., 2008; Metzger et al., 2009; Ramal et al., 2009; Costa Barbosa et al., 2014). According to Costa Barbosa et al., (2014) the increased mosquito density is related to previous rainy weather, which favors breeding sites with adequate water depth. Therefore, precipitation is a controlling factor in the density of Anopheles. Zeilhofer et al., (2007) postulated that non-significant differences of vector incidences between rainy and dry seasons were related to the availability of anthropogenic breeding habitats of the reservoir during the year. An increase in temperature has often been recognized as a factor accelerating the gonotrophic cycle of Anopheles mosquitoes, decreasing the interval between egg-laying episodes and increasing vector abundance (Mabaso et al., 2006; Kristan et al., 2008). However, the survival of adult mosquitoes may be jeopardized and breeding sites dried up more quickly if temperatures are too high, particularly during the dry season. This makes the number of malaria cases fall when temperatures are particularly high (Basurko et al., 2011).

ENSO is also a component of climate variability that influences the incidence of those three diseases. Particularly, the presence of El Niño increases the cases of leishmaniasis, dengue and malaria (Gagnon et al., 2001; Hanf et al., 2011; Ferreira, 2014; Ferreira de Souza et al., 2015; Boletín Epidemiológico Lima, 2016). For instance, Ramal et al., (2009) concluded that some climate variables could be associated with the transmission of malaria, though the importance of each of them varied from year to year. In the years of El Niño occurrence or in the years following the episodes, the greatest correlation took place. Low average temperature may favor the sporogonic and gonotrophic cycles of the vector. It is at this moment that the transmission potential of the vector population reaches its peak, which favors malaria transmission.

As far as chagas is concerned, most of the studies reviewed indicate a positive correlation with temperature (e.g., Vazquez-Prokopec et al., 2012; Delgado et al., 2013; Monte et al., 2014; Medone et al., 2015). In a review of climatic factors related to chagas disease transmission, Carcavallo (1999) postulated the need for a better understanding of the relationship between climatic factors and disease epidemiology mainly due to the forecast that global warming is in process and will have different kinds of effects during the next several decades. This work concludes that higher temperatures could extend the geographical distribution of wild vectors and lower humidity may shorten the life cycle.

Regarding leptospirosis, the scientific works show a significant correlation with rainfall and flooding (e.g., Vanasco et al., 2000; Costa et al., 2001; Tassinari et al., 2004; Schelotto et al., 2012; Gracie et al., 2014; Lacerda, et al., 2015; Lacerda, et al., 2018), and an influence of El Niño on the emergence of cases (López et al., 2017). For instance, Vanasco et al., (2000), mentioned an outbreak in Santa Fe province (Argentina) that took place during heavy rains and after a flood that hit the study area. A low land and flood area with abundant natural and artificial reservoirs of fresh water is described, where the presence of a high concentration of spirochetes compatible with leptospira was confirmed. This assumes the existence of conditions favorable for the survival of leptospira and the presence of numerous excretory species.

The most widely studied variable for schistosomiasis was precipitation (e.g., Giovanellia et al., 2001; Neto et al., 2013; Oliveira et al., 2013). However, temperature also seems to play a part, since it is likely to increase in a warmer climate (IPCC, 2014). For most works, both precipitation and temperature influence positively increasing vectors abundance (Santos et al., 2013), causing outbreaks (Simões Barbosa et al., 2001), accentuating hospital admissions (Dos Santos and Da Rocha Toledo Filho, 2014) or influencing the distribution pattern of vectors (Gardini Sanches Palasio, 2015).

The vectors of the different diseases yielded minimum, maximum and optimal values for each climatic variable which influenced biting rate, egg-to-adult survival and development rate, adult lifespan, fecundity, and activity among others (e.g., Castro Gomes et al., 1992 Souza Santos, 1999; Tineoet al., 2003; Carbajo et al., 2012; Catalá et al., 2015). Therefore, certain ranges of these climate variables should be incorporated in epidemiological studies as well as in models that evaluate the mechanisms of disease transmission. Along these lines, when changes in climate variables take place, the vectors of the different diseases show dissimilar patterns. For instance, Medone et al., (2015) point out a decreasing trend in the number of new cases of Tr. cruzi human infections per year between current and future conditions using a climatic niche approach in Argentina and Venezuela. They postulate that T. infestans do not seem to show a direct relationship with climate change, and this could be explained by the existence of other variables (socio-environmental or economic, among others) that were not included in the ecological niche models. Conversely, an extension of the latitudinal range of dispersion of Aedes aegypti is expected, which would allow this disease-transmitting insect to spread to regions where it was not previously found, from tropical zones to temperate zones (López -Latorre and Neira, 2016). Possibly because this vector is more dependent on climate factors.

3.2. Distribution of scientific publications

The diseases with greater geographical distribution of scientific papers were: chagas, malaria, leishmaniasis, and dengue (Figure 1–4). Leptospirosis and schistosomiasis were the less studied diseases (Fig. 5, 6). Table 3 lists the countries that lack information about the diseases under study and their vectors when comparing the geographical distribution of the scientific works (Figs. 1–6) to disease distribution (WHO, 2016; OIE, 2016).

Generally speaking, the representation of the geographical distribution of the publications in relation to the distribution of each disease and their overall incidence is good.

Table 3
Geographical distribution of diseases, works published, and most representative climate for each disease according to our literature review. "Countries not included" means the countries that did not submit scientific publications for this literature review.

Disease	Global incidence according to WHO	Distribution in South America *WHO **OIE	Countries not included	Most representative climate
Malaria	214 millions in 2015	South America except for Chile and Uruguay*	Chile, Guyana, Uruguay	Equatorial, tropical with dry winter
Schistosomiasis	61,6 million in 2014 (treated individuals)	Brazil, Suriname, Venezuela*	South America except Brazil	Data are not sufficient
Dengue	1,500,000 cases in 2015	South America except for Chile, Uruguay and northwestern and southern Argentina*	Chile, Uruguay	Equatorial, tropical Monsoon, subtropical with dry season Temperate with dry winter
Leishmaniasis	200,000–400,000/ year	South America except for Chile, Uruguay, Trinidad and Tobago, central and southern Argentina*	Guyana, Paraguay	Tropical with dry winter, Subtropical with dry season, Temperate with dry winter
Leptospirosis	1–10 cases every 100,000 individuals/year	South America**	South America except Argentina, Brazil, Uruguay	Equatorial, tropical Monsoon
Chagas	100–150 annual cases (6–7 million infected individuals)	South America*	–––––	Tropical with dry winter Warm semiarid
Chikungunya	1241,436 cases in 2016 each 1000 habitants	South America except for Chile and Uruguay	South America	––––––
Zika	31 countries and territories in America	South America*	South America	––––––

* WHO: World Health Organization
** OIE: World Organization for Animal Health

The exception is leptospirosis for which representation was very limited (Fig. 5, Table 3). Even though its incidence is not as high as that of other diseases, its manifestation was severe for most cases, and the mortality rate was well above 10% (WHO, 2010). The scarce literature available on this disease connects this pathology to rainfall and floods. Given the fact that some regions in South America are being affected by rainfall anomalies and that this results in the overflow of important rivers (Marengo et al., 2009; Re and Barros, 2009), leptospirosis is one of the diseases whose relation to climate variability in South America should be more thoroughly approached.

The geographical distribution of schistosomiasis prevails in Venezuela, Suriname and an area in central-eastern Brazil. The literature included in this review is well represented for Brazil, tough no research works were found from the other two countries. In this case, and in view of the reduced distribution of this disease, it would be interesting to compare how it behaves with respect to the climate in Venezuela and Suriname, where its incidence is lower (WHO, 2014).

3.3. Publications that included a geographic analysis

A geographic analysis gives information about the variations of a disease in relation to the main features of a given place (environmental, climatic, socio-economic, etc.). Out of all reviewed publications, 32 (12.22%) conducted different types of geographic analysis (Appendix). Some of them analyzed the geographical distribution of cases or vectors related to environmental and climate variables (Quintana et al., 2010; Gurgel-Goncalves et al., 2012; Ferreira, 2014; Gardini Sanches Palasio et al., 2015; Medone et al., 2015; Parra-Henao et al., 2016); others produced thematic/risk maps and studied spatial distribution of disease transmission (Spinelli et al., 2010; Rodrigues de Araujo Teixeira and Gonçalves Cruz, 2011; Stewart-Ibarra et al., 2014), or which environmental and socioeconomic factors, typically used to characterize the risks of leptospirosis transmission, are more relevant at different geographical scales (Gracie et al., 2014). Only two works covered all of South America (Ferreira, 2014; Hassan and Khormi, 2014), the rest were carried out at a more regional scale (country, departments, municipalities).

If we consider that the bibliographic review was carried out on emerging and high impact diseases that developed during the last years in South America, the number of studies with geographic analysis is scarce. Nonetheless, most of the work was conducted by local groups with the exception of chagas and dengue diseases. There is therefore an interest in developing these lines of research in the region, although there may be other constraints that prevent a better development (for example, economic factors such as lack of financing for projects of this kind and for human resources training).

Seventy percent of the work was carried out at a municipal scale. As a consequence, most data belong to specific places, including neighborhoods of those municipalities or non-urban areas (e.g., Monte Roraima or the Amazon region in Brazil). The main topics of these works are outbreaks associated with climate variables (e.g., Vanasco et al., 2000; Simões Barbosa et al., 2001; Mateus and Carrasquilla, 2011; Eastin et al., 2014), associations between vectors, diseases and climate variables (e.g., Monteiro Michalsky et al., 2009; Girod et al. 2011; Santos Oliveira et al., 2013), population studies of vectors transmitting dis-

Table 4
List of publications that studied outbreaks of different diseases and their relationship with the studied variables.

Disease	Outbreak year	Country	Biological Variable	Phenomenon or variable	Relationship with variable	Author/ year
Dengue	1955 to 1998	France Guiana, Indonesia, Colombia and Surinam	Dengue cases	El Niño	Positive significant	Gagnon et al. 2001
Dengue	1986, 1990, 1995, 1998, 2001	Rio de Janeiro, Brazil	Dengue cases	Temperature	Positive, significant	Portela Câmara et al. 2009
				Rainfall	Non-significant, quantitative	
Dengue	2001–2002, 2005, 2009–2010	Cauca valley, Colombia	Dengue cases	Temperature	Positive significant	Eastin et al. 2014
				Rainfall	Positive significant	
				Humidity	Positive significant	
				El Niño	Positive significant	
Dengue	2001,2002	São Paulo, Brazil	Dengue cases	Temperature Rainfall	Positive, significant	Ribeiro et al. 2006
Dengue	2010	El Oro, Ecuador	Dengue cases	Temperature	Positive significant	Stewart-Ibarra and Lowe 2013
				Rainfall	Positive significant	
				Oceanic Niño Index (ONI)	Positive significant	
Dengue	2010	Machala, Ecuador	Dengue cases	Temperature	Positive significant	Stewart-Ibarra et al. 2014
				Rainfall	Positive significant	
Dengue	2011,2012	Minas Gerais, Brazil	No. of eggs of *Aedes* ssp.	Temperature	Positive significant	Ferreira da Rocha Taranto et al. 2015
				Rainfall	Non-significant, quantitative	
Leishmaniasis	1996	Chaco, Argentina	*Lutzomyia intermedia* density	Temperature	Positive, qualitative	Salomon et al. 2001
				Rainfall	Positive, qualitative	
Leishmaniasis	2003	Tolima, Colombia	Incidence of leishmaniasis cases	Altitude	Unexplained spatial variation	Valderrama-Ardila et al. 2010
				Temperature	Unexplained spatial variation	
Leishmaniasis	2003	Corrientes, Argentina	Leishmaniasis cases	Temperature	Not significant, qualitative	Salomón et al. 2006
				Rainfall	Significant, qualitative	
				River level	Significant, qualitative	
Leptospirosis	1996	Rio de Janeiro, Brazil	Leptospirosis incidence rate	Flood	Positive, qualitative	Barcellos and Sabroza 2001
Leptospirosis	1998	Santa Fe, Argentina	Leptospirosis cases	Flood	Positive, qualitative	Vanasco et al. 2000
Malaria	1987–1994	Colombia	Malaria cases	Rainfall	Positive, significant	Mateus and Carrasquilla 2011
					Positive, significant	
Schistosomiasis	2000	Pernambuco, Brazil	Schistosomiasis cases	Flood	Positive, qualitative	Barbosa et al. 2001

Data were drawn from the bibliographic review carried out in this work between 1970 and 2016.

eases (e.g., Lorenzo et al., 2000; Steina et al., 2005; Dantur Juri et al., 2014; Moreno et al., 2015) and relationship between disease cases and climate or geographic variables (Sáez-Sáez et al., 2007; Basurko et al., 2011; Ruiz-López et al., 2016). Works that span major regions are less frequent. Generally these studies investigate the distribution of vectors (e.g., Gurgel-Goncalves et al., 2012; Alimi et al., 2015), the areas with the highest risk of transmission (e.g., Alimi et al., 2016; Pyszczek and Vidal Saez Sáez, 2016), spatial and temporal patterns of disease (e.g., Chowell et al., 2008; Cadavid Restrepo et al., 2014), and the influence of the ENSO on diseases (e.g., Mantilla et al., 2009; Hanf et al., 2011).

Earth-observing satellites have provided an unprecedented view at the land level but have been exploited relatively little for the measurement of environmental variables of particular relevance to epidemiology (Muñoz et al., 2011), which is evidenced in the works review conducted. Most research works agree in that remote sensing is a suitable tool for optimizing planning, efficacy and efficiency of vector-borne-disease control (Muñoz et al., 2011). It can be further applied to better understand the drivers of local vector-borne disease risk (Stewart-Ibarra et al., 2014) and can be successfully used in studies on the geographical distribution of disease vector species (Carbajal de la Fuente et al., 2009). In this respect, epidemiologic studies dealing with geographic analysis could assist in the development of new strategies to control disease, based on continuous efforts to maintain vector populations below levels that permit transmission.

3.4. Countries where outbreaks and associated variables were recorded

Fourteen publications (6.11%) specifically dealt with outbreaks of one of these diseases, and most climate variables revealed a significant relationship with a biological variable (Table 4). Two scientific works (0.86%) focused on dengue and leishmaniasis, respectively, in relation to future climate projections. Therefore, only 14 studies on outbreaks were published in the last 46 years in most of the free journals of South America. Indeed this figure is not very promising considering the wide extension of the study area and the impact of the diseases in the region. Knowing about the influence that climate variables can have on diseases is central to prevent and predict their behavior. Some countries have begun to use predictive models for health management (Triampo et al., 2007; Canals, 2010; Armién et al., 2016). Outbreak production tools represent an innovative change in the way health issues are addressed.

4. Conclusions

The objective of this work was to carry out a review of scientific works that relate vector-borne diseases to climate variability. To achieve this aim, a spatial representation of the study areas was prepared, and the spatial distribution for the detection of geographic regions with lack of information was analyzed. This methodology is widely applied in several fields of research, though it is uncommon in reviews of this nature. However, this method turned out to be very effective in comparing the distribution of publications for each disease, as well as in comparing them to climate and disease distribution maps. This methodology also allows to detect local groups and visualize the scales of analysis. Studies were conducted in areas including most climates in South America except for arid, temperate oceanic and Mediterranean oceanic climates. Most diseases from the publications under study occurred in equatorial and tropical climates. The disease represented by the largest number of different types of climates was dengue.

Dengue and leishmaniasis were the most studied and most widely represented diseases in South America. Regarding the vector-borne diseases included in Smith et al., (2014), only dengue fever was associated with climate variables at a global and local scale. As regards dengue, a positive association between outbreaks and precipitation, temperature and El Niño phenomenon was found. With respect to leishmaniasis, two out of three publications that accounted for the occurrence of outbreaks indicated an association mainly with precipitation. In terms of disease incidence, malaria was the most relevant infectious disease. Being among the three most studied diseases, it was detected that there were areas where this infectious disease was present but studies were absent. Malaria was more related to precipitation and the altitude limitation with respect to its vector. Schistosomiasis also assumed importance in terms of incidence, but presented the smallest number of publications. Besides, the geographical distribution of scientific works on this disease was limited to a few states in Brazil. It is associated with precipitation and floods. The literature on leptospirosis was scarce in bibliographic search engines, and it was mainly associated with rainfall and flood episodes. Leptospirosis is expected to intensify in some areas of South America such as in the Argentine humid region. Therefore, from our perspective, this bacterial infection could be the platform for further research on this topic. The impact of chagas disease is significant not so much due to its annual incidence of new cases but to its wide distribution and number of infected individuals (prevalence of illness). However, this has not been reflected in the number of papers that study its relationship with climate. Unfortunately, according to our results, this disease has not received the attention it deserves in South America. No research work associated Zica and Chikungunya cases to climate variables in South America. This is probably explained by the recent outbreaks of these diseases in this region. However, given that fact that they are both transmitted by the same mosquito species as dengue, their epidemiological behavior may be similar.

The technique used in this work allowed us to determine the status of knowledge of the main diseases associated with climate and climate variability in South America. However, it should be considered that only scientific publications were involved. Other data sources such as theses, and epidemiological reports for individual countries were not included at this stage of the study. Also, other climate-related diseases such as cholera and diarrheal disease were not included for not being of vectorial transmission. Still they are of great impact in the region and strongly related to climate variables. Future work could focus on some other bibliographic sources and diseases, as well as on patterns with special emphasis on water basins, biogeographic regions and political and socio-economic conditions which may also have an impact on disease incidence.

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Appendix

	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
1	*Aedes albopictus*	Castro Gomes A., Forattini O. P., áKakitani I., Marques, G. R. M.; de Azevedo Marques, C. C.; Marucci, D.; Brito, M.	1992	Rev. Saude Publ. Volume 26(2). Pages 108–118.	Microhabitats de *Aedes albopictus* (Skuse) naregião do Vale do Paraíba, Estado de SãoPaulo, Brazil.	Brazil	Municipality		Productivity of immature forms	Rainfall temperature	Positive qualitative
2	*Aedes aegypti*	Souza-Santos, R.	1999	Revista da Sociedade Brazileira de Medicina Tropical. Volume 32(4). Pages 373–382.	Fatores associados à ocorrência de formas imaturas de *Aedes aegypti* na Ilha do Governador, Rio de Janeiro, Brazil.	Brazil	Municipality		Presence of *A. aegypti* inmature	Temperature Humidity	Positive qualitative
3	*Aedes aegypti*	Vezzani, D.; Velázquez, S. M.; Schweigmann, N.	2004	Mem Inst Oswaldo Cruz. Volume 99(4). Pages 351–356.	Seasonal pattern of abundance of *Aedes aegypti* (Diptera: Culicidae) in Buenos Aires City, Argentina.	Argentina	Municipality		Abundance	Seasonality	Significantly different
4	Dengue	Fernando Portela Câmara, Adriana Fagundes Gomes, Gualberto Teixeira dos Santos e Daniel Cardoso Portela Câmara	2009	Rev. Soc. Brasileira de Med Trop. Volume 42(2). Pages 137–140	Clima e epidemias de dengue no Estado do Rio de Janeiro	Brasil	State/Province		Number of cases	Temperature Rainfall	Positive significant Not significant
5	*Aedes aegypti*	Micieli, M. V.; García, J. J.; Achinelly, M. F.; Martí, G. A.	2006	Rev. Biol. Trop. Volume 54 (3). Pages 979–983.	Dinámica poblacional de los estadios inmaduros del vector del dengue *Aedes aegypti* (Diptera: Culicidae): un estudio longitudinal (1996–2000).	Argentina	Municipality		Presence of *A. aegypti* immature stages	Temperature	Positive significant

(*continued on next page*)

	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
6	*Aedes aegypti, Aedes albopictus*	Alves Honório, N.; Cabello P. H.; Codeço, C. T.; Lourenço-de-Oliveira, R.	2006	Mem Inst Oswaldo Cruz. Volume 101(2). Pages 225–228.	Preliminary data on the performance of *Aedes aegypti* and *Aedes albopictus* immatures developing in water-filled tires in Rio de Janeiro.	Brazil	Municipality		*A. albopictus* median pupal mass *A. aegypti* Density of larvae	Water volume Temperature Driest months	No significant linear correlation No significant linear correlation Positive qualitative
7	*Aedes aegypti*	Silva Costa F.; Junqueira da Silva, J.; de Souza, C. M.; Mendes, J.	2008	Revista da Sociedade Brazileira de Medicina Tropical. Volume 41(3). Pages 309–312.	Dinâmica populacional de *Aedes aegypti* (L) em área urbana de alta incidência de dengue.	Brazil	Municipality		Proportion of hatched larvae Proportion of adults	Rainy season Dry season	Not significat Significantly different
8	*Aedes aegypti*	Siqueira de Souza, S.; Garcia da Silva, I.; Garcia da Silva, H. H.	2010	Revista da Sociedade Brazileira de Medicina Tropical. Volume 43(2). Pages 152–155.	Associação entre incidência de dengue, pluviosidade e densidade larvária de *Aedes aegypti*, no Estado de Goiás.	Brazil	State/Province		Larval infestation rate	Rainfall	Positive correlation
9	*Aedes aegypti*	Stewart Ibarra, A. M.; Ryan, S. J.; Beltra E., Mejia, R.; Silva M., Munoz A.	2013	Plos One. Volume 8(11). Pages 1–11.	Dengue vector dynamics (*Aedes aegypti*) influenced by climate and social factors in Ecuador: implications for targeted control.	Ecuador	Country		Oviposition activity	Rainfall Temperature	Significant predictors
10	*Aedes aegypti A. albopictus*	Brady, O. J.; Golding, N.; Pigott, D. M.; Kraemer, M. U. G.; Messina, J. P.; Reiner, Jr R. C.; Scott, T.W.; Smith, D. L.; Gething, P.W.; Hay, S. I.	2014	Parasites & Vectors. Volume 7. Page 1–17	Global temperature constraints on *Aedes aegypti* and *A. albopictus* persistence and competence for dengue virus transmission.		World		*A. aegypti* Persistence *A. albopictus* Persistence	Temperature	Significant predictor
11	*Aedes aegypti*	Couret, J.; Dotson, E.; Benedict, M.Q.	2014	PLOS ONE. Volume 9(2). Pages 1–9.	Temperature, larval diet, and density effects on development rate and survival of *Aedes aegypti.*	Peru	Municipality		Juvenile mortality	Temperature	Positive significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
12	*Aedes aegypti*	Degener, C. M.; Mingote Ferreira de Ázara, T.; Roque, R. A.; Torres Codeço, C.; Araújo Nobre, A.; Ohly, J. J.; Geier, M.; Eiras, A. E.	2014	Mem Inst Oswaldo Cruz. Volume 109(8). Pages 1030–1040.	Temporal abundance of *Aedes aegypti* in Manaus, Brazil, measured by two trap types for adult mosquitoes.	Brazil	Municipality		Female abundance	Rainfall Temperature Humidity	Significant predictor, positive relationship Significant predictor, negative relationship Best predictor, positive relationship
13	*Aedes aegypti*	Lana, R. M.; Carneiro, T. G. S.; Honório, N. A.; Codeco, C. T.	2014	Acta Tropica. Volume 129. Pages 25–32.	Seasonal and nonseasonal dynamics of *Aedes aegypti* in Rio de Janeiro, Brazil: fitting mathematical models to trap data Raquel.	Brazil	Municipality		Egg density	Seasonality	Significant predictor
14	*Aedes aegypti A. albopictus*	Ferreira da Rocha Taranto, M.; Marques Pessanha, J. E.; dos Santos, M.; dos Santos Pereira Andrade, A. C.; Neves Camargos, V.; Alves, N.	2015	Tropical Medicine and International Health. Volume 20 (1). Pages 77–88.	Dengue outbreaks in Divinopolis, south-eastern Brazil and the geographic and climatic distribution of *Aedes albopictus* and *Aedes aegypti* in 2011–2012.	Brazil	Municipality		Number of eggs	Rainfall Temperature	Not significant Positive significant
15	*Aedes aegypti A. albopictus*	Moura Rodrigues, M. G. R.; Alvarenga Monteiro Marques, L. L.; Nunes Serpa,M.; de Brito Arduino, J. C.; Voltolini, G. L.; Barbosa, V. R. A.; Castor de Lima, V. L.	2015	Parasites & Vectors 8. Pages 1–9.	Density of *Aedes aegypti* and *Aedes albopictus* and its association with number of residents and meteorological variables in the home environment of dengue endemic area, São Paulo, Brazil.	Brazil	State/Province		Dengue incidence rates	Rainfall Temperature	Positive significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
16	*Aedes aegypti*	Fuentes-Vallejo, M.; Higuera-Mendieta, D. R.; García-Betancourt, T.; Alcalá-Espinosa, L. A.; García-Sánchez, D.; Munévar-Cagigas, D. A.; Brochero, H. L.; González-Uribe, C.; Quintero, J.	2015	Cad. Saúde Pública. Volume 31(3). Pages 517–530.	Territorial analysis of *Aedes aegypti* distribution in two Colombian cities: a chorematic and ecosystem approach.	Colombia	Municipality		Vector density	Altitud Humidity Temperature	Explanatory variables in clusters
17	*Aedes aegypti*	Estallo, E. L.; Ludueña-Almeida, F. F.; Introini M. V.; Zaidenberg, M.; Almirón, W. R.	2015	Plos One. Pages 1–11.	Weather variability associated with *Aedes* (Stegomyia) *aegypti* (Dengue vector) oviposition dynamics in northwestern Argentina.	Argentina	Municipality		Number of eggs	Humidity Rainfall Temperature	Positive significant
18	*Aedes aegypti*	Costa, A. C. C.; Codeço, C. T.; Honório, N. A.; Pereira, G. R.; Pinheiro, C. F. N.; Nobre, A. A.	2015	Medical Informatics and Decision Making. Volume 15 (93). Pages 1–12.	Surveillance of dengue vectors using spatio-temporal Bayesian modeling.	Brazil	Municipality		Number of eggs	Rainfall Temperature	Explanatory variables
19	Anopheles	Berti, J.; Zimmerman, R.; Amarista, J.	1993	Memórias do Instituto Oswaldo Cruz. Volume 88(3). Pages 353–362.	Spatial and temporal distribution of anopheline larvae in two malarious areas in Sucre State, Venezuela.	Venezuela	State/Province	X	*A.aquasalisA.albitarsis*	Rainy season Dry season	Positive qualitative
20	*Anopheles darlingi*	Saito Monteiro de Barros, F.; Alves Honório, N.	2007	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 102(3). Pages 299–302.	Man biting rate seasonal variation of malaria vectors in Roraima, Brazil.	Brazil	Municipality		Mosquito distribution	River level	Positive qualitative

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
21	*Anopheles darlingi*	de Castro Gomes, A.; Bicudo de Paula, M.; Natal, D.; Davidson Gotlieb, S. L.; Mucci, L. F.	2010	Revista da Sociedade Brazileira de Medicina Tropical. Volume 43(5). Pages 516–522.	Effects of flooding of the River Paraná on the temporal activity of *Anopheles* (Nyssorhynchus) *darlingi* Root (Diptera: Culicidae), at the border State of Mato Grosso do Sul and São Paulo, Brazil.	Brazil	State/Province		Temporal activity	Floods	Positive qualitative
22	Anopheles	Dantur Juri, M. J.; Estallo, E.; Almirón, W.; Santana, M.; Sartor, P.; Lamfri, M.; Zaidenberg, M.	2015	Journal of Vector Ecology. Volume 40(1). Pages 36–45.	Satellite-derived NDVI, LST, and climatic factors driving the distribution and abundance of Anopheles mosquitoes in a former malarious area in northwest Argentina.	Argentina	State/Province		Abundance of adult *A.pseudopunctipennis A. argyritarsis A. strodei A. nuneztovari*	Temperature Temperature Rainfall Humidity	Positive significant Positive significant Not significant Positive significant
23	Chagas, *Triatoma infestans*	Gorla, D. E.; Catala, S. S.; Grilli, M. P.	1997	Acto Toxicol. Argent. Volume 5 (1). Pages 15–62.	Efecto de la temperatura sobre la distribución del *Triatoma infestans* y el riesgo de transmision vectorial de la enfermedad de chagas en Argentina.	Argentina	Country		Population growth rate	Temperature	Positive significant
24	Chagas, *Rhodnius pallescens*	Pizarro Novoa, J. C.; Romaña, C.	1998	Bull. Inst. Fr. Études Andines. Volume 27. Pages 309–325.	Variacion estacional de una población silvestre de *Rhodnius pallescens* Barber 1932 (Heteroptera: Triatominae) en la costa caribe colombiana.	Colombia	Municipality		Density Age composition	Seasonality	There were no significant differences They differed significantly

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
25	Chagas, *Triatoma brasiliensis*	Lorenzo, M. G.; Guarneri, A. A.; Pires, H. H. R.; Diotaiuti, L.; Lazzari, C. R.	2000	Cad. Saúde Pública, Rio de Janeiro. Voluem 16(2). Pages 69–74.	Aspectos microclimáticos del hábitat de *Triatoma brasiliensis.*	Brazil	Municipality		Geographical distribution	Humidity Temperature	Positive qualitative
26	Chagas, *Triatoma infestans*	Gorla, D. E.	2002	Ecología Austral. Volume 12. Pages 117–127.	Variables ambientales registradas por sensores remotos como indicadores de la distribución geográfica de *Triatoma infestans* (Heteroptera: Reduviidae).		Continental		Geographical distribution	Temperature	Discriminant analysis
27	Chagas, Triatominos	Cuba, C. A.; Abad-Franch, F.; Roldán Rodríguez, J.; Vargas Vásquez, F.; Pollack Velásquez, L.; Miles, M. A.	2002	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 97(2). Pages 175–183.	The Triatomines of northern Peru, with emphasis on the ecology and infection by Trypanosomes of *Rhodnius ecuadoriensis* (Triatominae).	Peru	State/Province		*Belminus peruvianus Cavernicola pilosa Rhodnius ecuadoriensis Rhodnius robustus Rhodnius pictipes Eratyrus cuspidatus Hermanlentia matsunoi Panstrongylus chinai Panstrongylus geniculatus Panstrongylus herreri Panstrongylus rufotuberculatus Triatoma carrioni Triatoma dimidiata Triatoma nigromaculata*	Altitude Rainfall Temperature	Description of ranges Description of ranges
28	Lutzomyia, Leishmaniasis, Lutzomyia	Gomes Pinheiro, F.; Bessa Luz, S. L.; Ramos Franco, A. M.	2008	Acta Amazonica. Volume 38(1). Pages 165–172.	Infecção natural por tripanosomatídeos (Kinetoplastida: Trypanosomatidae) em *Lutzomyia umbratilis* (Diptera: Psychodidae) em áreas de leishmaniose tegumentar americana no Amazonas, Brazil.	Brazil	Municipality		Natural infection of L. *umbratilis*females	Rainfall	Negative qualitative

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
29	Chagas, *Triatoma pseudomaculata T. wygodzinskyi*	Carbajal de la Fuente, A. L.; Porcasi, X.; Noireau Diotaiuti, L.; Gorla, D. E.	2009	Infection, Genetics and Evolution Volume 9. Pages 54–61.	The association between the geographic distribution of *Triatoma pseudomaculata* and *Triatoma wygodzinskyi* (Hemiptera: Reduviidae) with environmental variables recorded by remote sensors.	Brazil	State/Province	X	Geographic distribution	Altitud Temperature	Significant predictors
30	Chagas, *Rhodnius neglectus R. nasutus*	Almeida Batista, T.; Gurgel-Gonçalves, R.	2009	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 104(8). Pages 1165–1170.	Ecological niche modelling and differentiation between *Rhodnius neglectus* Lent, 1954 and *Rhodnius nasutus* Stål, 1859 (Hemiptera: Reduviidae: Triatominae) in Brazil.	Brazil	State/Province		Ecological niche *R.nasutus* Ecological niche *R.nasutus*and *R. neglectus*	Rainfall Temperature Rainfall Temperature	Negative qualitative Negative qualitative Different significantly Different significantly
31	Chagas, *Triatoma infestans*	Vazquez-Prokopec, G. M.; Spillmann, C.; Zaidenberg, M.; Gurtler, R. E.; Kitron, U.	2012	Plos Neglected Tropical Diseases. Volume 6(8). Pages 1–13.	Spatial heterogeneity and risk maps of community infestation by *Triatoma infestans* in Rural northwestern Argentina.	Argentina	Municipality	X	Spatial distribution	Temperature	Not significant
32	Chagas, Triatoma	Gurgel-Goncalves, R.; Galvao, C.; Costa, J.; Townsend Peterson, A.	2012	Journal of Tropical Medicine. Volume 2012. Pages 1–15.	Geographic distribution of Chagas disease vectors in Brazil based on ecological niche modeling of Chagas disease vectors.	Brazil	Country	X	Geographic distribution	Rainfall Temperature	Ecological niche modeling
33	Chagas	Mischler, P.; Kearney, M.; McCarroll, J. C.; Scholte R. G. C.; Vounatsou, P.; Malone, J. B.	2012	Geospatial Health. Volume 6(3). Pages 59–66.	Environmental and socio-economic risk modelling for Chagas disease in Bolivia.	Bolivia	Country		Chagas disease	Altitude Rainfall Temperature	Description of ranges

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
34	Chagas, *Triatoma infestans*	Delgado, S.; Ernst, K. C.; Hancco Pumahuanca, M. L.; Yool, S. R.; Comrie, A. C.; Sterling, C. R.; Gilman, R. H.; Náquira, C.; Levy, M. Z.; and the Chagas Disease Working Group	2013	Delgado et al. International Journal of Health Geographics. Volume 2013(12). Pages 1–12.	A country bug in the city: urban infestation by the Chagas disease vector *Triatoma infestans* in Arequipa, Peru.	Peru	Municipality		Household infestation	Temperature	Positive significant
35	Chagas, Triatoma	Mendes Pereira, J.; Silva de Almeida, P.; Vieira de Sousa, A.; Moraes de Paula, A.; Bomfim Machado, R.; Gurgel-Gonçalves, R.	2013	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 108(3). Pages 335–341.	Climatic factors influencing triatomine occurrence in Central-West Brazil.	Brazil	State/Province		Geographic distributions	Rainfall Temperature	Explanatory variables
36	Chagas, *Eratyrus mucronatus*	Silva Monte, G. L.; Tadei, W. P.; Marinho Farias, T.	2014	Revista da Sociedade Brazileira de Medicina Tropical. Volume 47(6). Pages 723–727.	Ecoepidemiology and biology of *Eratyrus mucronatus* Stål, 1859 (Hemiptera: Reduviidae: Triatominae), a sylvatic vector of Chagas disease in the Brazilian Amazon.	Brazil	Municipality		Ecoepidemiological characteristics	Humidity Temperature	Description of the variable
37	Chagas, Triatoma, Rhodnius	Medone, P.; Ceccarelli, S.; Parham, P. E.; Figuera, A.; Rabinovich, J. E.	2015	Phil. Trans. R. Soc. B. Volume 370. Pages 1–12.	The impact of climate change on the geographical distribution of two vectors of Chagas disease: implications for the force of infection.	Venezuela y Argentina	Municipality	X	Force of infection	Rainfall Temperature	Explanatory variables

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
38	Chagas, Triatoma	Catalá, S.; Mendonça Bezerra, C.; Diotaiuti, L.	2015	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 110(6). Pages 793–796.	Thermal preferences and limits of Triatoma Braziliensis in its natural environment - Field observations while host searching.	Brazil	Municipality		Thermal preferences	Temperature	Description of the variable
39	Chagas, *Triatoma braziliensis T. melanica*	de Cássia Moreira de Souza, R.; Campolina-Silva, G. H.; Mendonça Bezerra, C.; Diotaiuti, L.; Gorla, D. E.	2015	Parasites & Vectors. Volume 8 (361). Pages 2–4.	Does *Triatoma braziliensis* occupy the same environmental niche space as *Triatoma melanica*?	Brazil	State/Province		Geographic distribution	Altitude Rainfall Temperature	Generalized linear models
40	Chagas, Triatoma	Péneau, J.; Nguyen, A.; Flores-Ferrer, A.; Blanchet, D.; Gourbière, S.	2016	Plos Neglected Tropical Diseases. Pages 1–23.	Amazonian triatomine biodiversity and the transmission of Chagas disease in French Guiana: in Medio Stat Sanitas.	French Guiana	State/Province		Triatomine abundance	Rainfall	Negative significant
41	Chagas,Triatoma	Cavallo, M. J.; Amelotti, I.; Gorla, D. E.	2016	Journal of Vector Ecology. Volume 41(1). Pages 97–102.	Invasion of rural houses by wild Triatominae in the arid Chaco.	Argentina	Municipality		House invasion	Rainfall Temperature	Not significant
42	Chagas, *Triatoma dimidiata*	Parra-Henao, G.; Quirós-Gómez, O.; Jaramillo, N.; Segura Cardona, A.	2016	Am. J. Trop. Med. Hyg. Volume 94(4). Pages 767–774.	Environmental determinants of the distribution of Chagas disease vector *Triatoma dimidiata* in Colombia.	Colombia	State/Province	X	Distribution	Rainfall Temperature	Explanatory variables
43	Dengue, *Aedes aegypti*	Domínguez, M. C.; Ludueña Almeida, F. F.; Almirón, W. R.	2000	Rev Soc Entomol Argent. Volume 59. Pages 41–50.	Dinámica poblacional de *Aedes aegypti* (Diptera: Culicidae) en Córdoba Capital.	Argentina	Municipality		Eggs number	Rainfall Temperature	Positive significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
44	Dengue	Gagnon, A. S.; Bush, A. B. G.; Smoyer-Tomic, K. E.	2001	Clim Res. Volume 19. Pages 35–43	Dengue epidemics and the El Niño Southern Oscillation.	Colombia, French Dengue epidemics Guiana and Surinam	Country		Dengue epidemics	El Niño	Positive significant
45	Dengue, *Aedes aegypti*	Micieli, M. V.; Campos, R. E.	2003	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 98(5). Pages 659–663.	Oviposition activity and seasonal pattern of a population of *Aedes* (Stegomyia) *aegypti* (L.) (Diptera: Culicidae) in Subtropical Argentina.	Argentina	Municipality		Oviposition activity Pattern of immature *A. aegypti*	Rainfall Rainfall	Negative cuanlitative Positive qualitative
46	Dengue	Gonçalves Neto, S. V.; Macário Rebêlo, J. M.	2004	Cad. Saúde Pública. Volume 20(5). Pages 1424–1431.	Aspectos epidemiológicos do dengue no Município de São Luís, Maranhão, Brazil, 1997–2002.	Brazil	Municipality		Dengue cases	Rainfall Temperature Humidity	Positive significant
47	Dengue	Rifakis, I. P.; Gonçalves, C. N.; Omaña, R. W.; Manso, M. M.; Espidel, G. A.; Intingaro, R. A.; Hernández, M. O.; Rodríguez-Morales, A. J.	2005	Rev Peru Med Exp Salud Pública. Volume 22(3). Pages 183–190.	Asociación entre las variaciones climáticas y los casos de dengue en un hospital de Caracas, Venezuela 1998–2004.	Venezuela	Municipality		Dengue incidence	Rainfall Temperature El Niño – La Niña	Positive significant Positive significant Significantly different
48	Dengue, *Aedes aegypti*	Steina, M.; Oriaa, G. I.; Almirónb, W. R.; Willener, J. A.	2005	Rev Saúde Pública 2005. Volume 39(4). Pages 559–64.	Fluctuación estacional de *Aedes aegypti* en Chaco, Argentina.	Argentina	Municipality		Activity *A. aegypti*	Rainfall Temperature	Positive qualitative
49	Dengue	Ribeiro, A. F.; Marquez, G. R. A. M.; Voltolini, J. C.; Condino, M. L. F	2006	Rev Saúde Pública. Volume 40(4). Pages 671–676.	Associação entre incidência de dengue e variáveis climáticas.	Brazil	Municipality		Dengue cases	Rainfall Temperature	Positive significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
50	Dengue	Rosa-Freitas, M. G.; Schreiber, K. V.; Tsouris, P.; de Souza Weimann, E. T.; Luitgards-Moura, J. F.	2006	Rev Panam Salud Pública. Volume 20(4). Pages 256–267.	Associations between dengue and combinations of weather factors in a city in the Brazilian Amazon.	Brazil	Municipality		Dengue cases	Humidity Temperature	Positive significant Negative significant
51	Dengue	Nadja, M.; Sousa, N. R.; Targino, D.; Limeira, R. C.	2007	Revista Brazileira de Meteorologia. Volume 22(2). Pages 183–192.	Influencia de variaveis meteorologicas sobre a incidencia do dengue, meningite e pneumonia em Joao Pessoa- PB.	Brazil	Municipality		Dengue cases	Rainfall Temperature	Positive significant
52	Dengue	Alcantara de Souza, I. C.; Pinheiro de Toledo, R.; Ronei, V.; de Moraes, M.	2007	Cad. Saúde Pública. Volume 23(11). Pages 2623–2630.	Modelagem da incidência do dengue na Paraíba, Brazil, por modelos de defasagem distribuída.	Brazil	State/Province		Dengue incidence	Rainfall	Positive significant
53	Dengue	Araújo Lima, E.; Nóbrega, F. J. N.; Gomes Filho, M. F.	2008	Revista Brazileira de Meteorologia. Volume 23 (3). Pages 264–269.	A relacao da previsao da precitacao pluviometrica e casos de dengue nos estados de alagoas e paraiba nordeste do Brazil.	Brazil	State/Province		Dengue cases	Rainfall	Positive significant
54	Dengue	Díaz-Quijano, F. A.; González-Rangel, A. L.; Gómez-Capacho, A.; Espíndola-Gómez, R.; Martínez-Vega, R. A.; Villar-Centeno, L. A.	2008	Rev. Salud Pública. Volume 10(2). Pages 250–259.	Pluviosidad como predictor de consulta por síndrome febril agudo en un área endémica de Dengue.	Colombia	Municipality		Dengue cases	Rainfall	Positive significant
55	Dengue, *Aedes aegypti*	Dias Zeidler, J.; Amézaga Acosta, P. O.; Pereira Barrêto, P.; da Silva Cordeiro, J.	2008	Rev Saúde Pública. Volume 42(6). Pages 986–991.	Vírus dengue em larvas de *Aedes aegypti* sua dinâmica de infestação, Roraima, Brazil.	Brazil	Regional		Eggs number Dengue incidence	Rainfall	Positive qualitative Negative qualitative

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
56	Dengue	Luz, P. M.; Mendes B. V. M.; Codeço, C. T.; Struchiner, C. J.; Galvani, A. P.	2008	Am. J. Trop. Med. Hyg. Volume 79(6). Pages 933–939.	Time series analysis of Dengue incidence in Rio de Janeiro, Brazil.	Brazil	Municipality		Dengue incidence	Rainfall Temperature	Non-explanatory variables
57	Dengue, *Aedes aegypti*	Chowell, G.; Torre, C. A.; Munayco-Escate, C.; Suárez-Ognio, L., López-Cruz, R.; Hyman, J. M.; Castillo-Chavez, C.	2008	Epidemiol. Infect. Volume 136. Pages 1667–1677.	Spatial and temporal dynamics of dengue fever in Peru: 1994–2006.	Peru	Country		Dengue cases	Rainfall Temperature	Explanatory variables
58	Dengue, *Aedes aegypti*	Torres Codeço, C.; Alves Honório, N.; Ríos-Velásquez, C. M.; Alves dos Santos, M. C.; Mattos, I. V.; Bessa Luz, S.; Reis, I. C.; da Cunha, G. B.; Goreti Rosa-Freitas, M.; Tsouris, P.; Gonçalves de Castro, M.; Nogueira Hayd, R. L.; Luitgards-Moura, J. F.	2009	Mem Inst Oswaldo Cruz. Volume 104(4). Pages 614–620.	Seasonal dynamics of *Aedes aegypti* (Diptera: Culicidae) in the northernmost state of Brazil: a likely port-of-entry for dengue virus 4.	Brazil	State/Province		Eggs number	Rainy season Dry season	Different qualitatively
59	Dengue	Coutinho Monteiro, S. E.; Elsy Coelho, M.; Soares da Cunha, L.; Salmito Cavalcante, M. A.; Aécio de Amorim Carvalho, F.	2009	Epidemiol. Serv. Saúde. Volume 18(4). Pages 365–374.	Aspectos epidemiológicos e vetoriais da dengue na cidade de Teresina, Piauí – Brazil, 2002 a 2006.	Brazil	Municipality		Dengue incidence	Rainfall Temperature	Positive significant
60	Dengue, *Aedes aegypti*	Honorio, N. A.; Codeco, C. T.; Alves, F. C.; Magalhaes, M. A.; Lourenco de Oliveira, R.	2009	Journal of Medical Entomology Volume 46(5). Pages1001-1014.	Temporal distribution of *Aedes aegypti* in different districts of Rio de Janeiro, Brazil, measured by two types of traps.	Brazil	Municipality		*A.aegypti* abundance	Rainfall Temperature	Positive significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
61	Dengue, *Aedes aegypti*	Siqueira de Souza, S.; Garcia da Silva, I.; Garcia da Silva, H. H.	2010	Revista da Sociedade Brazileira de Medicina Tropical. Volume 43(2). Pages152-155.	Associação entre incidência de dengue, pluviosidade e densidade larvária de *Aedes aegypti*, no Estado de Goiás.	Brazil	State/Province		Dengue incidence Index of property infestation	Rainfall Rainfall	Positive significant
62	Dengue	Monsalve, N. C.; Rubio-Palis, Y.; Pérez, M. E.	2010	Boletín de Mariologia y Salud Ambiental. Volume L(2). Pages 219–232.	Modelaje Bayesiano espacio-temporal de factores asociados con la incidencia del dengue en el área metropolitana de Maracay, Venezuela.	Venezuela	Municipality		Dengue incidence	Rainfall Temperature	Explanatory variables
63	Dengue, *Aedes aegypti*	Navarro, J. C.; Del Ventura, F.; Zorrilla, A.; Liria, J.	2010	Rev. Biol. Trop. Volume 58 (1). Pages 245–254.	Registros de mayor altitud para mosquitos (Diptera: Culicidae) en Venezuela.	Venezuela	Country		Mosquito records	Altitude	Upper limits
64	Dengue	Cassab, A.; Morales, V.; Mattar, S.	2011	Rev. Salud Pública. Volume 13 (1). Pages 115–128.	Factores climáticos y casos de Dengue en Montería, Colombia. 2003–2008.	Colombia	Municipality		Dengue cases	Rainfall Temperature Humidity ENSO	Not significant Not significant Not significant Negative qualitative
65	Dengue, *Aedes aegypti*	Rubio-Palis, Y.; Pérez-Ybarra, L. M.; Infante-Ruíz, M.; Comach, G.; Urdaneta-Márquez, L.	2011	Boletín de Malariología y Salud Ambiental. Volume LI(2). Pages 145–157.	Influencia de las variables climáticas en la casuística de dengue y la abundancia de *Aedes aegypti* (Diptera: Culicidae) en Maracay, Venezuela.	Venezuela	Municipality		Dengue cases Abundance *Aedes aegypti* Abundance *Aedes aegypti*	Rainfall Temperatura Humidity Rainfall Temperatura Humidity	Positive significant Not significant Not significant Positive significant Not significant Not significant
66	Dengue	Rodrigues de Araujo Teixeira, T.; Gonçalves Cruz, O.	2011	Cad. Saúde Pública. Volume 27(3). Pages 591–602.	Spatial modeling of dengue and socio-environmental indicators in the city of Rio de Janeiro, Brazil.	Brazil	Municipality	X	Dengue cases	Rainfall	Positive significant
67	Dengue	Chowell, G.; Cazelles, B.; Broutin, H.; Munayco, C. V.	2011	BMC Infectious Diseases. Volume 11(164). Pages 1–14.	The influence of geographic and climate factors on the timing of dengue epidemics in Perú, 1994–2008.	Peru	Country		Dengue epidemics in jungle and coastal regions	Temperature	Different significantly
68	Dengue	Rúa Uribe, G. L.; Calle Londoño, D. A.; Rojo Ospina, R. A.; Henao Correa, E. A.; Sanabria González, W. H.; Suárez Acosta, C. R.	2012	Iatreia. Volume 25(4). Pages 314–322.	Influencia del evento climático El Niño sobre la dinámica de transmisión de dengue en Medellín, Antioquia, Colombia.	Colombia	Municipality		Dengue incidence	El Niño	Positive significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
69	Dengue	Fagundes Gomes, A.; Araújo Nobre, A.; Gonçalves Cruz, O.	2012	Cad. Saúde Pública. Volume 28(11). Pages 2189–2197.	Temporal analysis of the relationship between dengue and meteorological variables in the city of Rio de Janeiro, Brazil, 2001–2009.	Brazil	Municipality		Dengue cases	Rainfall Temperature	Explanatory variables
70	Dengue	Buczak, A. L.; Koshute, P. T.; Babin, S. M.; Feighner, B. H.; Lewis, S. H.	2012	Medical Informatics and Decision Making. Volume 12(124). Pages 1–20.	A data-driven epidemiological prediction method for dengue outbreaks using local and remote sensing data.	Peru	State/Province		Dengue outbreaks	Rainfall Temperature	Explanatory variables
71	Dengue	Parker, D.; Holman, D.	2012	Int J Infect Dis. Volume 11. Pages 793–798.	Event history analysis of dengue fever epidemic and inter-epidemic spells in Barbados, Brazil, and Thailand.	Brazil	Country		Inter-epidemic spells duration Epidemic spells duration Inter-epidemic spells duration	Temperature Temperature Drought	Negative significant Positive significant Positive qualitative
72	Dengue	Carbajo, A. E.; Cardo M. V.; Vezzani, D.	2012	International Journal of Health Geographics. Volume 11(26). Pages 1–11.	Is temperature the main cause of dengue rise in non-endemic countries? The case of Argentina.	Argentina	Country		Climatic, geographic and demographic variables	Temperature	Explanatory variables
73	Dengue	Rúa-Uribe, G. L.; Suárez-Acosta, C. J.; Ventosilla, P.; Almanza, R.	2013	Biomédica. Volume 33(1). Pages 142–52.	Modelado del efecto de la variabilidad climática local sobre la transmisión de dengue en Medellín (Colombia) mediante análisis de series temporales.	Colombia	Municipality		Dengue incidence	Sea surface temperatura (ENSO)	Positive significant
74	Dengue	Stewart-Ibarra, A. M.; Lowe, R.	2013	Am. J. Trop. Med. Hyg. Volume 88(5). Pages 971–981.	Climate and non-climate drivers of Dengue epidemics in southern coastal Ecuador.	Ecuador	State/Province		Presence of *A.aegypti* pupae	El Niño Rainfall Temperature	Positive significant
75	Dengue	Feitosa Valadares, A.; Rodrigues, J.; Filho, C.; Mucci Peluzio, J.	2013	Epidemiol. Serv. Saúde, Brasília. Volume 22(1). Pages 59–66.	Impacto da dengue em duas principais cidades do Estado do Tocantins: infestação e fator ambiental (2000 a 2010).	Brazil	State/Province		Dengue incidence	Rainfall Temperature	Not significant
76	Dengue, *Aedes aegypti*	Breser, V. J.; Diez, F.; Rossi, G. C.; Micieli, M. V.	2013	Rev. Soc. Entomol. Argent. Volume 72(1–2). Pages 111–114.	Determinación del período estacional de oviposición de *Aedes aegypti* (Diptera: Culicidae) en la ciudad de Santa Rosa, La Pampa, Argentina.	Argentina	Municipality		Oviposición	Temperature	Lower limit

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
77	Dengue	Ferreira, M. C.	2014	Geospatial Health. Volume 9(1). Pages 141–151.	Geographical distribution of the association between El Niño South Oscillation and dengue fever in the Americas: a continental analysis using geographical information system-based techniques.		Continental	X	Dengue cases	ENSO	Positive significant
78	Dengue, *Aedes aegypti*	Khormi, H. M.; Kumar L.	2014	Geospatial Health. Volume 8(2). Pages 405–415.	Climate change and the potential global distribution of *Aedes aegypti*: spatial modelling using geographical information system and CLIMEX.		World	X	Geographical distribution	Rainfall Temperatura Humidity	Explanatory variables
79	Dengue	Meza-Ballesta, A.; Gónima, L.	2014	Rev. Salud Pública. Volume 16(2). Pages 293–306.	Influencia del clima y de la cobertura vegetal en la ocurrencia del Dengue (2001–2010).	Colombia	State/Province		Dengue cases	Rainfall Temperature	Positive significant
80	Dengue	Eastin, M. D.; Delmelle, E.; Casas, I.; Wexler, J.; Self, C.	2014	Am. J. Trop. Med. Hyg. Volume 91(3). Pages 598–610.	Intra- and interseasonal autoregressive prediction of Dengue outbreaks using local weather.	Colombia	Municipality		Dengue outbreaks	Humidity Rainfall Temperature	Positive significant
81	Dengue	Flamand, C.; Fabregue, M.; Bringay, S.; Ardillon, V.; Quénel, P.; Desenclos, J. C.; Teisseire, M.	2014	J Am Med Inform Assoc. Volume 21(2). Pages 232–240.	Mining local climate data to assess spatiotemporal dengue fever epidemic patterns in French Guiana.	French Guiana	Country		Dengue incidence	Rainfall Temperature Humidity	Positive significant
82	Dengue	Stewart-Ibarra, A. M.; Muñoz, A. G.; Ryan, S. J.; Beltrán Ayala, E.; Borbor-Cordova, M. J.; Finkelstein, J. L.; Mejía, R.; Ordoñez, T.; Recalde-Coronel, G. C.; Rivero, K.	2014	BMC Infectious Diseases. Volume 14. Pages 1–16.	Spatiotemporal clustering, climate periodicity, and social-ecological risk factors for dengue during an outbreak in Machala, Ecuador, in 2010.	Ecuador	Municipality	X	Dengue transmission	Rainfall Temperature	Positive significant
83	Dengue	Cadavid Restrepo, A.; Baker, P.; Clements, A. C. A.	2014	Tropical Medicine and International Health. Volume 19(7). Pages 863–871.	National spatial and temporal patterns of notified dengue cases, Colombia 2007–2010.	Colombia	Country		Dengue cases	Rainfall Temperature	Nonlinear significant Not significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
84	Dengue, *Aedes aegypti*	Gimenez, J. O.; Fischer, S.; Zalazar, L.; Stein, M.	2015	Journal of Medical Entomology. Volume 52(5). Pages 879–885.	Cold season mortality under natural conditions and subsequent hatching response of *Aedes* (Stegomyia) *aegypti* (Diptera: Culicidae) eggs in a subtropical city of Argentina.	Argentina	State/Province		Mortality rate of *A. aegypti* eggs	Seasons	Different significantly
85	Dengue	Medeiros Silva, A.; Marques da Silva, R.; Pereira de Almeida, C. A.; da Silva Chaves, J. J.	2015	Soc. & Nat., Uberlândia. Volume 27(1). Pages 157–169.	Modelagem geoestatistica dos casos de dengue e da variacao termo pluviometrica em Joao Pessoa, Brazil.	Brazil	Municipality		Dengue cases	Rainfall Temperature Humidity	Explanatory variables
86	Dengue	Araujo, R. V.; Albertinib, M. R.; Costa-da-Silva, A. L.; Suesdek, L.; Soares Franceschi, N. C.; Marc¸al Bastos, N.; Katz, G.; Ailt Cardoso, V.; Ciotek Castro, B.; Capurro, M. L.; Anacleto Cardoso Allegro, V. L.	2015	Braz J Infect Dis. Volume 19(2). Pages 146–155.	São Paulo urban heat islands have a higher incidence of dengue than other urban áreas.	Brazil	State/Province		Dengue incidence	Temperature	Explanatory variable
87	Dengue	Campbell, K. M.; Haldeman, K.; Lehnig, C.; Munayco, C. V.; Halsey, E. S.; Laguna-Torres, V. A.; Yagui, M.; Morrison, A. C.; Lin, C. D.; Scott, T. W.	2015	Plos Neglected Tropical Diseases. Pages 1–26.	Weather regulates location, timing, and intensity of Dengue virus transmission between humans and mosquitoes.	Peru	Country		Dengue virus transmission	Humidity Temperature	Explanatory variables
88	Dengue, *Aedes aegypti*	Chadee, D. D.; Martinez, R.	2016	Acta Tropica Volume 156. Pages 137–143.	*Aedes aegypti* (L.) in Latin American and Caribbean region: With growing evidence for vector adaptation to climate change?	Trinidad y Tobago	Municipality		Adaptive behaviours	Temperature	Positive significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
89	Dengue	Yang, M. H.; Boldrini, J. L.; Fassoni, A. C.;Souza Freitas, L. F.; Gomez, M. C.; Barboza de Lima, K. K.; Andrade, V. R.; Ribas Freitas, A. R.	2016	Plos One. Pages 1–41.	Fitting the incidence data from the city of Campinas, Brazil, based on Dengue transmission modellings considering time-dependent entomological parameters.	Brazil	Municipality		Dengue cases	Rainfall Temperature	Explanatory variables
90	Dengue	Drummond Silva, F.; Miranda dos Santos, A.; da Graça Carvalhal Frazão Corrêa, R.; Mendes Caldas, A. J.	2016	Ciência & Saúde Coletiva. Volume 21(2). Pages 641–646.	Temporal relationship between rainfall, temperature and occurrence of dengue cases in São Luís, Maranhão, Brazil.	Brazil	Municipality		Dengue cases	Rainfall Temperature	Positive significant Not significant
91	Dengue		2016	Boletin Epidemiológico Lima. 35. Ministerio de Salud. Peru.		Peru	Country		Dengue cases	El Niño	Positive qualitative
92	Dengue, *Aedes aegypti*	Ruiz-López, F.; González-Mazo, A.; Vélez-Mira, A.; Gómez, G. F.; Zuleta, L.; Uribe, S.; Vélez-Bernal, I. D.	2016	Biomédica. Volume 36. Pages 303–308.	Presencia de *Aedes* (Stegomyia) *aegypti* (Linnaeus, 1762) y su infección natural con el virus del dengue en alturas no registradas para Colombia.	Colombia	Municipality		Presence of *Aedes aegypti*	Altitude	Upper limit
93	Dengue, Aedes	Pyszczek, O. L.; Sáez, V.	2016	Terra Nueva Etapa. Volume 51. Pages 133–161.	Ocurrencia y amenaza de Dengue, Chikungunya y Zika causada por mosquitos del género Aedes la situación en la República Argentina 2015.	Argentina	Country	X	Dengue, Chikungunya and Zika cases	Rainfall Temperature	Positive qualitative
94	Leishmaniasis, Phlebotomine	Teodoro, U.; La Salvia Filho, V.; de Lima, E. M.; Palma Spinosa, R.; Barbosa, O. C.; Moreira Costa Ferreira, M. E.; Gomes Verzignassi Silveira, T.	1993	Rev Saúde Pública. Volume 27(3). Pages 190–194.	Flebotomíneos em área de transmissão de leishmaniose tegumentar na região norte do Estado do Paraná - Brazil: Variação sazonal e atividade noturna.	Brazil	Municipality		Densidade	Seasonality	Different qualitatively

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
95	Leishmaniasis	Nascimento, M. D. D. S.; Costa, J. M.; Fiori, B. I. P.; Viana, G. M. C.; Filho, M. S. G.; Alvim, A. C.; Bastos, O. C.; Nakatani, M.; Reed, S.; Badaró, R.; da Silva, A. R.; Burattini, M. N.	1996	Revista da Sociedade Brazileira de Medicina Tropical. Volume 29(3). Pages 233–240.	Aspectos epidemiológicos determinantes na manutenção da leishmaniose visceral no Estado do Maranhão – Brazil.	Brazil	State/Province		Number of cases	Rainfall	Positive qualitative
96	Leishmaniasis, Psychodidae	Cabanillas, M. R. S.; Castellón, E. G.	1999	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 94(3). Pages 289–296.	Distribution of sandflies (Diptera: Psychodidae) on tree-trunks in a non-flooded area of the Ducke Forest Reserve, Manaus, AM, Brazil.	Brazil	Municipality	X	Sandfly distribution	Rainy season Dry season	Different qualitatively
97	Leishmaniasis	Salomon, O. D.; Bogado de Pascual, M.; Molinari M. L.; Verri, V.	2001	Rev. Inst. Med. Trop. S. Paulo. Volume 43(2). Pages 99–104.	Study of cutaneous leishmaniasis outbreak in General Vedia, Province of Chaco, 1996.	Argentina	Municipality		Leishmaniasis outbreak	Rainfall Temperature	Positive qualitative
98	Leishmaniasis, Psychodidae	Ferreira, A. L.; Sessa, P. A.; Malta Varejão, J. B.; Falqueto, A.	2001	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 96(8). Pages 1061–1067.	Distribution of Sand Flies (Diptera: Psychodidae) at different altitudes in an endemic region of american Cutaneous Leishmaniasis in the State of Espírito Santo, Brazil.	Brazil	Municipality	X	Distribution of Sand Flies	Altitude	Upper limits
99	Leishmaniasis, Phebotomine	Salomón, O. D.; Rossi, G. D., Spinelli, G. R.	2002	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 97(2). Pages 163–168.	Ecological aspects of Phebotomine (Diptera, Psychodidae) in an endemic area of tegumentary Leishmaniasis in the northeastern Argentina, 1993–1998.	Argentina	Municipality		Leishmaniasis outbreak	Rainfall Temperature	Descriptive

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
100	Leishmaniasis	Thompson, R. A.; Wellington de Oliveira Lima, J.; Maguire, J.; Braud, D. H.; Scholl, D. T.	2002	Am. J. Trop. Med. Hyg. Volume 67(6). Pages 648–655.	Climatic and demographip determinants of american visceral leishmaniasis in northeastern Brazil using remote sensing technology for enviromental categorization of rain and region influences on Leishmaniasis.	Brazil	Municipality		Cases of Leishmaniasis	Rainfall	Negative quantitative
101	Leishmaniasis	Franke, C. R.; Ziller, M.; Staubach, C.; Latif, M.	2002	Emerging Infectious Diseases. Volume 8(9). Pages 914–917.	Impact of the El Niño/Southern Oscillation on Visceral Leishmaniasis, Brazil.	Brazil	State/Province		Leishmaniasis incidence	El Niño	Explanatory variables
102	Leishmaniasis	Salomon, O. D; Sosa Estani, S.; Dri, L.; Donnet, M.; Galarza, R.; Recalde, H; Tijera,A.	2002	Medicina (Buenos Aires). Volume 62. Pages 562–568.	Leishmaniosis tegumentaria en Las Lomitas, Provincia de Formosa, Argentina, 1992–2001.	Argentina	Municipality		Cases of Leishmaniosis	Rainfall River level Temperature	Positive significant Positive significant Not signicant
103	Leishmaniasis, Phlebotomine	Córdoba Lanus, E.; Salomón, O. D.	2002	Rev. Inst. Med. Trop. S. Paulo. Volume 44(1). Pages 23–27.	Phlebotominae fauna in the province of Tucumán, Argentina.	Argentina	Municipality		Abundance	Seasonality	Different qualitatively
104	Leishmaniasis, Phlebotomine	Salomón, O. D.; Rossi, G. C.; Cousiño, B.; Spinelli, G. R.; Rojas de Arias, A. R.; López del Puerto, D. G.; Ortiz, A. J.	2003	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 98(2). Pages 185–190.	Phlebotominae sand flies in Paraguay: abundance distribution in the southeastern región.	Paraguay	Municipality	X	Abundance	Seasonality	Different qualitatively
105	Leishmaniasis, Phlebotomine	Margonari de Souza, C.; Pessanha, J. E., Andrade Barata, R.; Michalsky Monteiro, E.; Carmargos Costa, D.; Santos Dias, E.	2004	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 99(8). Pages 795–803.	Study on Phlebotomine Sand Fly (Diptera: Psychodidae) Fauna in Belo Horizonte, State of Minas Gerais, Brazil.	Brazil	Municipality		Number Phlebotomine Sand Fly	Humidity Rainfall Temperature	No significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
106	Leishmaniasis, Phlebotomine	Andrade Barata, R.; França da Silva, J. C.; da Costa, R. T.; Latorre Fortes-Dias, C.; Costa da Silva, J.; Vieira de Paula, E.; Prata, A.; Michalsky Monteiro, E.; Santos Dias, E.	2004	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 99(5). Pages 481–487.	Phlebotomine Sand Flies in Porteirinha, an area of American Visceral Leishmaniasis Transmission in the State of Minas Gerais, Brazil.	Brazil	Municipality		Number of phlebotomine sand flies	Humidity Rainfall Temperature	Significant correlation Significant correlation Not significant
107	Leishmaniasis, Phebotomine	Couto Lemos, J.; do Carmo Lima, S.	2005	Revista da Sociedade Brazileira de Medicina Tropical. Volume 38(1). Pages 22–26.	Leishmaniose tegumentar americana: flebotomíneos em área de transmissão no Município de Uberlândia, MG.	Brazil	Municipality		Number of flebotomíneos	Humidity Rainfall Temperature	Positive qualitative
108	Leishmaniasis	Cabaniel, G. S.; Rada, L. T.; Blanco, J. J. G.; Rodríguez-Morales, A. J.; Escalera, A. J. P.	2005	Rev Peru Med Exp Salud Publica. Volume 22(1). Pages 32–38.	Impacto de los eventos de el niño southern oscillation (ENSO) sobre la leishmaniosis cutánea en Sucre, Venezuela, a través del uso de información satelital, 1994–2003.	Venezuela	State/Province		Leishmaniasis incidence	ENSO	Negative significant
109	Leishmaniasis	Salomón, O. D.; Sosa-Estani, S.; Ramos, K.; Orellano, P.W.; Sanguesa, G.; Fernández, G.; Sinagra, A.; Rapasciolli, G.	2006	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 101(7). Pages 767–774.	Tegumentary leishmaniasis outbreak in Bella Vista City, Corrientes, Argentina during 2003.	Argentina	Municipality		Leishmaniasis outbreak	Floods Rainfall	Positive qualitative Positive qualitative
110	Leishmaniasis	Cardenas, R.; Sandoval, C. M.; Rodriguez-Morales, A. J.; Paredes, C. F.	2006	Am. J. Trop. Med. Hyg. Volume 75(2). Pages 273–277.	Impact of climate variability in the occurrence of leishmaniasis in northeastern Colombia.	Colombia	State/Province		Number of leishmaniasis cases	El Niño La Niña	Significantly different
111	Leishmaniasis, Lutzomyia	Feliciangeli, M. D.; Delgado, O.; Suarez, B.; Bravo, A.	2006	Tropical Medicine and International Health. Volume 11(12). Pages 1785–1791.	Leishmania and sand flies: proximity to woodland as a risk factor for infection in a rural focus of visceral leishmaniasis in west central Venezuela.	Venezuela	Municipality		Density	Rainfall	Positive qualitative

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
112	Leishmaniasis, Phlebotomine	Traviezo, L. E.	2006	Biomédica. Volume 26(1). Pages 73–81.	Flebotomofauna al sureste del estado Lara, Venezuela.	Venezuela	Municipality		Abundance	Humidity Rainfall Temperature	Negative qualitative Negative qualitative Positive qualitative
113	Leishmaniasis, Phlebotomine	Salomón, O. D.; Orellano, P. W.; Lamfri, M.; Scavuzzo, M.; Dri, L.; Farace, M. I.; Ozuna Quintana, D.	2006	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 101(3). Pages 295–299	Phlebotominae spatial distribution asssociated with a focus of tegumentary leishmaniasis in Las Lomitas, Formosa, Argentina, 2002.	Argentina	Municipality		Transmission peak	River level	Positive qualitative
114	Leishmaniasis, Flebotomíneos	Santos Dias, E.; França-Silva, J. C.; Costa da Silva, J.; Michalsky Monteiro, E.; de Paula, K. M.; Macedo Gonçalves, C.; Andrade Barata, R.	2007	Revista da Sociedade Brazileira de Medicina Tropical. Volume 40(1). Pages 49–52.	Flebotomíneos (Diptera: Psychodidae) de um foco de leishmaniose tegumentar no Estado de Minas Gerais.	Brazil	Municipality		Number of Flebotomíneos	Humidity Rainfall Temperature	There is no correlation
115	Leishmaniasis	Vanzeli, A. C.; Kanamura, H. N.	2007	Rev PanamInfectol. Volume 9(3). Pages 20–25.	Estudo de fatores socioambientais associados a ocorrencia de leishmaniose tegumentar americana no municipio de Ubatuba, SP, Brazil.	Brazil	Municipality		Leishmaniasis incidence	Rainfall Temperature	There is no correlation
116	Leishmaniasis, Phlebotomine	Odorizzi, R. M. F. N.; Galati, E. A. B.	2007	Rev Saúde Pública. Volume 41(4). Pages 645–52.	Flebotomíneos de várzea do rio Aguapeí, região noroeste do Estado de São Paulo, Brazil.	Brazil	Municipality		Number of Flebotomíneos	Seasonality	Different significantly
117	Leishmaniasis, Phlebotomine	Akemi Missawa, N.; Santos Dias, E.	2007	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 102(8). Pages 913–918.	Phlebotomine sand flies (Diptera: Psychodidae) in the municipality of Várzea Grande: an area of transmission of visceral leishmaniasis in the state of Mato Grosso, Brazil.	Brazil	Municipality		Phlebotomine density	Humidity Rainfall Temperature	Not significant
118	Leishmaniasis, Lutzomyia	Cortés, L. A.; Fernández, J. J.	2008	Biomédica. Volume 28. Pages 433–440.	Especies de Lutzomyia en un foco urbano de leishmaniasis visceral y cutánea en El Carmen de Bolívar, Bolívar, Colombia.	Colombia	Municipality		Abundance	Humidity Temperature	Positive significant Negative significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
119	Leishmaniasis, Phlebotomine	Brandão Nunes, V. L.; Bianchi Galati, E. A.; Cardozo, C.; Ghizzi Rocca, M. E.; Oliveira de Andrade, A. R.; Ferreira da Cunha Santos, M.; Braga Aquino, R.; da Rosa, D.	2008	Revista Brazileira de Entomologia. Volume 52(3). Pages 446–451.	Estudo de flebotomíneos (Diptera, Psychodidae) em área urbana do município de Bonito, Mato Grosso do Sul, Brasil.	Brazil	Municipality		Abundance *L. longipalpis*	Seasonality	Different qualitatively
120	Leishmaniasis	Alessi, C. A.; Galati, E. A.; Alves, J. R.; Corbett, C. E.	2009	Rev. Inst. Med. Trop. S. Paulo. Volume 51(5). Pages 277–282.	American cutaneous leishmaniasis in the Pontal of Paranapanema - SP, Brazil: ecological and entomological aspects.	Brazil	Municipality		Number of sandflies	Temperature	There is no correlation
121	Leishmaniasis, *Lutzomyia longipalpis*	Monteiro Michalsky, E.; Latorre Fortes-Dias, C.; França-Silva, J. C.; Fonseca Rocha, M.; Andrade Barata, R.; Santos Dias, E.	2009	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 104(8). Pages 1191–1193.	Association of *Lutzomyia longipalpis* (Diptera: Psychodidae) population density with climate variables in Montes Claros, an área of American visceral leishmaniasis transmission.	Brazil	Municipality		Population density	Humidity Rainfall Temperature	Explanatory variables
122	Leishmaniasis, Flebotomíneos	Santos Albano Amóra, S.; Leal Bevilaqua, C. M.; Marlon Carneiro Feijó, F.; Melo de Oliveira, C. G.; Xavier Peixoto, G. C.; Nonato de Sousa, R.; Dutra Alves, N.; Beserra de Oliveira, L. M.; Térsia Freitas Macedo, I.	2010	Rev. Bras. Parasitol. Vet., Jaboticabal. Volume 19(4). Pages 233–237.	Sandflies (Psychodidae: Phlebotominae) survey in an urban transmission area of visceral leishmaniasis, northeastern Brazil.	Brazil	Municipality		Population density	Humidity Rainfall Temperature	There is no correlation

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
123	Leishmaniasis, Flebotomíneos	Silva de Almeida, P.; Ramos Minzão, E.; Donizethe Minzão, L.; da Silva, S. R.; Dimas Ferreira, A.; Faccenda, O.; Andrade Filho, J. D.	2010	Rev Soc Bras Med Trop. Volume 43(6). Pages723-727.	Aspectos ecológicos de flebotomíneos (Diptera: Psychodidae) em área urbana do município de Ponta Porã, Estado de Mato Grosso do Sul.	Brazil	Municipality		Abundance	Humidity Rainfall Temperature	Positive significant
124	Leishmaniasis, Phebotomine	Quintana, M. G.; Salomo, O. D.; Lizarralde de Grosso, L. S.	2010	Journal of medical entomology Volume 47(6). Pages 1003–1010.	Distribution of Phlebotomine Sand Flies (Diptera: Psychodidae) in a Primary Forest-Crop Interface, Salta, Argentina.	Argentina	Municipality	X	Abundance	Rainfall	Negative significant
125	Leishmaniasis	Valderrama-Ardila, C.; Aexander, N.; Ferro, C.; Cadena, H.; Marín, D.; Holford, T. R.; Munstermann, L. R.; Ocampo, C. B.	2010	Am. J. Trop. Med. Hyg. Volume 82(2). Pages 243–250.	Environmental risk factors for the incidence of american cutaneous Leishmaniasis in a sub-andean zone of Colombia (Chaparral, Tolima).	Colombia	Municipality		Incidence	Altitude Temperature	Not explain spatial variation
126	Leishmaniasis, *Lutzomyia longipalpis*	Santos Albano Amóra, S.; Leal Bevilaqua, C. M.; de Castro Dias, E.; Marlon Carneiro Feijó, F.; Melo de Oliveira, P. G.; Peixoto G. C. X.; Dutra Alves, N.; Beserra de Oliveira, L. M.; Tértsia Freitas Macedo, I.	2010	Rev. Bras. Parasitol. Vet., Jaboticabal. Volume 19(1). Pages 39–43.	Monitoring of *Lutzomyia longipalpis* Lutz & Neiva, 1912 in an area of intense transmission of visceral leishmaniasis in Rio Grande do Norte, Northeast Brazil.	Brazil	Municipality		Population density	Humidity Rainfall Temperature	There is no correlation

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
127	Leishmaniasis	de Castro Viana, G. M.; Soares Brandão Nascimento, M. D.; Fernandes Rabelo, E. M.; Diniz Neto, J. A.; Binda Júnior, J. R.; de Souza Galvão, C.; Carvalho dos Santos, A.; Santos Júnior, O. M.; Souza de Oliveira, R. A.; Silva Guimarães, R.	2011	Revista da Sociedade Brazileira de Medicina Tropical. Volume 44(6). Pages 722–724.	Relationship between rainfall and temperature: observations on the cases of visceral leishmaniasis in São Luis Island, State of Maranhão, Brazil.	Brazil	Municipality		Number of cases	Rainfall Temperature	Positive significant Not significant
128	Leishmaniasis, Phlebotomine	Ferro, C.; Marín, D.; Góngora, R.; Carrasquilla, M. C.; Trujillo, J. E.; Rueda, N. K.; Marín, J.; Valderrama-Ardila, C.; Alexander, N.; Pérez, M.; Munstermann, L. E.; Ocampo, C. B.	2011	Am. J. Trop. Med. Hyg. Volume 85(5). Pages 847–856.	Phlebotomine vector ecology in the domestic transmission of american cutaneous Leishmaniasis in Chaparral, Colombia.	Colombia	Municipality		Abundance	Rainfall	Negative cualitavite
129	Leishmaniasis, Lutzomyia	Fuenzalida, A. D.; Quintana, M. G.; Salomón, O. D.; Lizarralde de Grosso, M. S.	2011	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 106(5). Pages 635–638.	Hourly activity of *Lutzomyia neivai* in the endemic zone of cutaneous leishmaniasis in Tucumán, Argentina: preliminary results.	Argentina	Municipality		Abundance	Humidity Temperature	Positive qualitative

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
130	Leishmaniasis, Phlebotomine	Andrade Barata, R.; Fontes Paz, G.; Cardoso Bastos, M.; Oliveira Andrade, R. C.; Campos Mendes de Barros, D.; Oliveira Lara e Silva, F.; Monteiro Michalsky, E.; da Costa Pinheiro, A.; Santos Dias, E.	2011	Revista da Sociedade Brazileira de Medicina Tropical. Volume 44(2). Pages 136–139.	Phlebotomine sandflies (Diptera: Psychodidae) in Governador Valadares, a transmission area for American tegumentary leishmaniasis in State of Minas Gerais, Brazil.	Brazil	Municipality		Phlebotomine density	Humidity Rainfall Temperature	Positive significant Positive significant Not significant
131	Leishmaniasis, *Lutzomyia longipalpis*	Martins Queiroz, M. F.; Ramos Varjão, J.; de Moraes, S. C.; Salcedo, G. E.	2012	Revista da Sociedade Brazileira de Medicina Tropical. Volume 45(3). Pages 313–317.	Analysis of sandflies (Diptera: Psychodidae) in Barra do Garças, State of Mato Grosso, Brazil, and the influence of environmental variables on the vector density of *Lutzomyia longipalpis* (Lutz & Neiva, 1912).	Brazil	Municipality		Frequency	Humidity Rainy season Temperature	Significant correlation Positive qualitative There is no correlation
132	Leishmaniasis, *Nyssomyia neivai, N. intermedia*	Saraiva, L.; Mayr de Lima Carvalho, G.; de Castilho Sanguinette, C.; Alves de Carvalho, D. A.; Andrade, Filho J. D.	2012	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 107(7). Pages 867–872.	Biogeographical aspects of the occurrence of *Nyssomyia neivai* and *Nyssomyia intermedia* (Diptera: Psychodidae) in a sympatric area of the Brazilian Savannah.	Brazil	Municipality		Number of insects	Humidity Rainfall Temperature	Positive qualitative Positive qualitative Positive qualitative
133	Leishmaniasis, Phlebotomine	Machado de Oliveira Legriffon, C.; Rosi Reinhold-Castro, K.; Carvalho Fenelon, V.; Coeto Neitzke-Abreu, H.; Teodoro, U.	2012	Revista da Sociedade Brazileira de Medicina Tropical. Volume 45(1). Pages 77–82.	Sandfly frequency in a clean and well-organized rural environment.	Brazil	Municipality			Temperature	Positive qualitative
134	Leishmaniasis, Lutzomyia	Lambraño Cruz, L. F.; Manjarrez Pinzón, G.; Bejarano Martínez, E. E.	2012	Salud Uninorte. Barranquilla (Col.). Volume 28 (2). Pages 191–200.	Variación temporal de especies de Lutzomyia (Diptera: Psychodidae) en el área urbana de Sincelejo (Colombia).	Colombia	Municipality		Abundance	Rainfall Temperature	Positive significant Not significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
135	Leishmaniasis, Phlebotomine	de Souza Pinto, I.; Riva Tonini, J. F.; Ferreira, A. L.; Falqueto, A.	2012	Biota Neotrop. Volume 12(1). Pages 323–326.	A brief inventory of sand flies (Diptera, Psychodidae) from the national forest of the Rio Preto, state of the Espírito Santo, southeastern Brazil.	Brazil	Municipality		Diversity and equitability Species richness	Seasonality	Different qualitative
136	Leishmaniasis, Lutzomyia	de Lourdes Sierpe Jeraldo, V.; de Oliveira Góes, M. A.; Casanova, C.; Moura de Melo, C.; de Araújo, E. D.; Pinto Brandão Filho, S.; Esdras Rocha Cruz, D.; Pinto, M. C.	2012	Revista da Sociedade Brazileira de Medicina Tropical. Volume 45(3). Pages 318–322.	Sandfly fauna in an area endemic for visceral leishmaniasis in Aracaju, State of Sergipe, Northeast Brazil.	Brazil	Municipality		Abundance	Rainfall	Positive significant
137	Leishmaniasis, Psychodidae	Lima Silva, C. M.; Santos Moraes, L.; Almeida Brito, G.; Caldas dos Santos, C. L.; Macário Rebêlo, J. M.	2012	Revista da Sociedade Brazileira de Medicina Tropical. Volume 45(6). Pages 696–700.	Ecology of phlebotomines (Diptera, Psychodidae) in rural foci of leishmaniasis in tropical Brazil	Brazil	Municipality		Abundance	Rainfall	Positive qualitative
138	Leishmaniasis, Lutzomyia	Sangiorgi, B.; Neves Miranda, D.; Ferreira Oliveira, D.; Passos Santos, E.; Regis Gomes, F.; Oliveira Santos, E.; Barral, A.; Miranda, J. C.	2012	Journal of Tropical Medicine. Pages 1–5.	Natural breeding places for Phlebotomine sand flies (Diptera: Psychodidae) in a semiarid region of Bahia State, Brazil.	Brazil	Municipality		Number of adult	Humidity Rainfall Temperature	Not significant Not significant Positive significant
139	Leishmaniasis, Phlebotomine	Fitipaldi Veloso Guimarães, V. C.; Lemos Costa, P.; da Silva, F. J.; Thais da Silva, K.; Gaudêncio da Silva, K.; Freitas de Araújo, A. I.; Gomes Rodrigues, E. H.; Pinto Brandão Filho, S.	2012	Revista da Sociedade Brazileira de Medicina Tropical. Volume 45(1). Pages 66–70.	Phlebotomine sandflies (Diptera: Psychodidae) in São Vicente Férrer, a sympatric area to cutaneous and visceral leishmaniasis in the State of Pernambuco, Brazil.	Brazil	Municipality		Number of sandflies	Rainfall Temperature	Not significant Not significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
140	Leishmaniasis	Furtado Mozini Cardim, M.; Colebrusco Rodas, L. A.; Dibo, M. R.; Monteiro Guirado, M.; Oliveira, A. M.; Chiaravalloti-Neto, F.	2013	Rev Saúde Pública. Volume 47(4). Pages 691–700.	Introdução e expansão da Leishmaniose visceral americana em humanos no estado de São Paulo, 1999–2011.	Brazil	State/Province		Expansion Leishmaniose	Rainfall Temperature	There is no correlation, qualitative
141	Leishmaniasis, *Lutzomyia antunesi*	Vásquez Trujillo, A.; González Reina, A. E.; Góngora Orjuela, A.; Prieto Suárez, E.; Palomares, J. E.; Buitrago, Alvarez, L. E.	2013	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 108(4). Pages 463–469.	Seasonal variation and natural infection of *Lutzomyia antunesi (*Diptera: Psychodidae: Phlebotominae), an endemic species in the Orinoquia region of Colombia.	Colombia	Municipality		Abundance	Rainfall Temperature	Negative significant Positive significant
142	Leishmaniasis	Roger, Mathieu Nacher, A.; Hanf, M.; Drogoul, A. S.; Adenis, A.; Basurko, C.; Dufour, J.; Sainte Marie, D.; Blanchet, D.; Simon, S.; Carme, B.; Couppie, P.	2013	Am. J. Trop. Med. Hyg. Volume 89(3). Pages 564–569.	Climate and Leishmaniasis in French Guiana.	French Guiana	Country		Number of infections	El Niño Rainfall Temperature	Positive significant Negative significant Positive significant
143	Leishmaniasis, *Lutzomyia longipalpis*	Acosta, L. A.; Mondragón-Shem, K.; Vergara, D.; Vélez-Mira, A.; Cadena, H.; Carrillo-Bonilla, L.	2013	Biomédica. Volume 33. Pages 319–25.	Ampliación de la distribución de *Lutzomyia longipalpis* (Lutz & Neiva, 1912) (Diptera: Psychodidae) en el departamento de Caldas: potencial aumento del riesgo de leishmaniasis visceral.	Colombia	State/Province		Distribución	Altitude Temperature	Upper limit Positive qualitative
144	Leishmaniasis	Karagiannis-Voules, D. A.; Scholte, R. G. C.; Guimaraes, L. H.; Utzinger, J.; Vounatsou, P.	2013	Plos Neglected Tropical Diseases. Volume 7(5). Pages 1–13.	Bayesian geostatistical modeling of Leishmaniasis incidence in Brazil.	Brazil	Country		Incidence	Rainfall Temperature	Explanatory variables

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
145	Leishmaniasis, *Lutzomyia longipalpis*	de Oliveira, E. F.; dos Santos Fernandes, C. E.; Araújo e Silva, E.; Peçanha Brazil, R.; Gutierrez de Oliveira, A.	2013	Journal of Vector Ecology. Volume 38(2). Pages 224–228.	Climatic factors and population density of *Lutzomyia longipalpis* (Lutz & Neiva, 1912) in an urban endemic area of visceral leishmaniasis in midwest Brazil.	Brazil	Municipality		Density	Humidity Rainfall Temperatura Wind speed	Not significant Not significant Not significant Negative significant
146	Leishmaniasis, Pintomyia	Galvis Ovallos, F.; Espinosa Silva, Y. R.; Fernandez, N.; Gutierrez, R.; Bianchi Galati, E. A.; Sandoval, C. M.	2013	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 108(3). Pages 297–302.	The sandfly fauna, anthropophily and the seasonal activities of *Pintomyia spinicrassa* (Diptera: Psychodidae: Phlebotominae) in a focus of cutaneous leishmaniasis in northeastern Colombia.	Colombia	Municipality		Abundance	Humidity Rainfall Temperature	Negative significant Negative significant Positive significant
147	Leishmaniasis, Psychodidae	Moschin, J. C.; Galvis Ovallos, F.; Sei, L. A.; Galati, E. A. B.	2013	Rev Bras Epidemiol. Volume 16(1). Pages 190–201.	Ecological aspects of phlebotomine fauna (Diptera, Psychodidae) of Serra da Cantareira, Greater São Paulo metropolitan region, state of São Paulo, Brazil.	Brazil	Municipality		Number of *P. fischeri*	Humidity Temperature	Negative significant Positive significant
148	Leishmaniasis, *Lutzomyia longipalpis*	Lemos Costaa, P.; Dantas-Torresa, F.; da Silva, F. J.; Fitipaldi Veloso Guimarãesa, V. C.; Gaudêncioa, K.; Pinto Brandão-Filhoa, S.	2013	Acta Tropica 126. Pages 99–102.	Ecology of *Lutzomyia longipalpis* in an area of visceral leishmaniasis transmission in north-eastern Brazil.	Brazil	Municipality		Abundance	Humidity Rainfall Temperature	Not significant
149	Leishmaniasis	Sobral de Almeida, A.; Loureiro Werneck, G.; da Costa Resendes, A. P.	2014	Cad. Saúde Pública, Rio de Janeiro. Volume 30(8). Pages 1639–1653.	Classificação orientada a objeto de imagens de sensoriamento remoto em estudos epidemiológicos sobre leishmaniose visceral em área urbana.	Brazil	Municipality	X	Incidence	Temperature	Negative significant
150	Leishmaniasis	Oliveira, B. B. I.; Lima Batista, H.; Mucci Peluzio, J.; Araci Hoffmann Pfrimer, I.; Melo Rodrigues, F.; Rodrigues do Carmo Filho, J.	2014	Revista da Sociedade Brazileira de Medicina Tropical. Volume 47(4). Pages 476–482.	Epidemiological and environmental aspects of visceral leishmaniasis in children under 15 years of age between 2007 and 2012 in the city of Araguaína, State of Tocantins, Brazil.	Brazil	Municipality		Number of cases	Rainfall Temperature	Not significant Negative significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
151	Leishmaniasis, Phlebotomine	Oliveira de Andrade, A. R.; Kato da Silva, B. A.; Cristaldo, G.; Oliveira de Andrade, S. M.; Paranhos Filho, A. C.; Ribeiro, A.; Ferreira da Cunha Santos, M; Andreotti, R.	2014	Parasites & Vectors. Volume 7. Pages 1–7.	Spatial distribution and environmental factors associated to phlebotomine fauna in a border area of transmission of visceral leishmaniasis in Mato Grosso do Sul, Brazil.	Brazil	Municipality	X	Number of cases	Rainy season	Descriptive
152	Leishmaniasis	Rosales, J. C.; Yang, H. M; Avila Blas, O. J.	2014	Interdisciplinary Perspectives on Infectious Diseases. Volume 2014. Pages 1–11.	Variability modeling of rainfall, deforestation, and incidence of American Tegumentary Leishmaniasis in Orán, Argentina, 1985–2007.	Argentina	Municipality		Incidence	Rainfall	Not explanatory
153	Leishmaniasis, Phlebotomine	Holanda Campelo Júnior, J.; Djunko Miyazaki, R.;	2014	Rev Patol Trop. Volume 43(4). Pages 470–482.	Spatial distribution and temporal variability of phlebotominae at the Cuiabá campus of the Federal University of Mato Grosso, Brazil.	Brazil	Municipality		Occurrence of Phlebotominae	Humidity Temperature	Description of ranges
154	Leishmaniasis, *Lutzomyia longipalpis*	Pereira Spada, J. C.; da Silva, D. T.; Real Martins, K. R.; Colebrusco Rodas, L. A.; Alves, M. L.; Amorim Faria, G.; Costa Buzutti, M.; Silva, H. R.; Starke-Buzetti, W. A.	2014	Braz. J. Vet. Parasitol., Jaboticabal. Volume 23(4). Pages 456–462.	Occurrence of *Lutzomyia longipalpis* (Phlebotominae) and canine visceral leishmaniasis in a rural area of Ilha Solteira, SP, Brazil.	Brazil	Municipality		Prevalence of peridomestic vectors	Humidity Rainfall Temperature	Not significant
155	Leishmaniasis, Phlebotomine	Ferreira de Souzaa, B. C.; Quaresmab, P. F.; Andrade Filhoc, J. D.; Dias Bevilacquad, P.	2014	Acta Tropica. Volume 134. Pages 72–79.	Phlebotomine fauna in the urban area of Timóteo, State of MinasGerais, Brazil.	Brazil	Municipality		Number of captured phlebotomines	Humidity Rainfall Temperature	Not significant Not significant Positive significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
156	Leishmaniasis, *Lutzomyia cruzi*	Nogueira de Brito, V.; do Bom Parto Ferreira de Almeida, A.; Nakazato, L.; Duarte, R.; de Oliveira Souza, C.; Franco Sousa, V. R.	2014	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 109(7). Pages 899–904.	Phlebotomine fauna, natural infection rate and feeding habits of *Lutzomyia cruzi* in Jaciara, state of Mato Grosso, Brazil.	Brazil	Municipality		Monthly distribution of L. *cruzi*	Humidity Rainfall Temperature	There is no correlation There is no correlation There is moderate correlation
157	Leishmaniasis, *Lutzomyia flaviscutellata*	Carvalho, B. M.; Rangel, E. F.; Ready, P. D.; Vale, M. M.	2015	Plos one. Pages 1–21.	Ecological niche modelling predicts southward expansion of *Lutzomyia* (Nyssomyia) *flaviscutellata* (Diptera: Psychodidae: Phlebotominae), vector of Leishmania (Leishmania) amazonensis in South America, under Climate Change.	Brazil, French Guiana, Suriname, Colombia, Peru, Trinidad and Tobago Venezuela, Bolivia and Ecuador	Continental		Future projections	Rainfall Temperature	Ecological niche modelling
158	Leishmaniasis	Ferreira de Souza, R. A.; Andreoli, R. V.; Toshie Kayano, M.; Lima Carvalho, A.	2015	Geospatial Health. Volume 10. Pages 40–47.	American cutaneous leishmaniasis cases in the metropolitan region of Manaus, Brazil: association with climate variables over time.	Brazil	Municipality		Number of cases	El Niño La Niña Rainfall Temperature	Descriptive
159	Leishmaniasis, Phlebotomine	Silva de Almeida, P.; Sciamarelli, A.; Mira Batista, P.; Dimas Ferreira, A.; Nascimento, J.; Raizer, J.; Andrade Filho, J. D.; Gurgel-Gonçalves, R.	2015	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 108(8). Pages 992–996.	Predicting the geographic distribution of Lutzomyia longipalpis (Diptera: Psychodidae) and visceral leishmaniasis in the state of Mato Grosso do Sul, Brazil.	Brazil	State/Province	X	Geographic distribution	Rainfall Temperature	Explanatory variables

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
160	Leishmaniasis	Pérez-Flórez, M.; Ocampo, C. B.; Valderrama-Ardila, C.; Alexander, N.	2016	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 111(7). Pages 433–442.	Spatial modeling of cutaneous leishmaniasis in the andean region of Colombia.	Colombia	Municipality		Incidence	Rainfall Temperature	Positively associated
161	Leishmaniasis	Pérez-Flórez, M.; Ocampo, C. B.; Valderrama-Ardila, C. B.; Alexander, N.	2016	Ciência & Saúde Coletiva. Volume 21(1). Pages 263–272.	Impacto das mudanças climáticas sobre a leishmaniose no Brazil.	Brazil	Country		Number of hospital admissions	Rainfall Temperature	Positive significant Not significant
162	Leishmaniasis, Psychodidae	de Lima Carvalho, G. M.; de Vasconcelos, F. B.; Goncalves Da Silva, D.; Botelho, H. A.; Andrade Filho, J. D.	2016	Journal of Medical Entomology Volume 48(4). Pages 764–769.	Diversity of phlebotomine sand flies (Diptera: Psychodidae) in Ibitipoca State Park, Minas Gerais, Brazil.	Brazil	Municipality		Diversity	Seasonality	Different qualitative
163	Leishmaniasis, *Lutzomyia longipalpis*	Freire de Melo Ximenes, M. F.; Castello, E. F.; De Souza, M. F.; Menezes, A. L. A.; Wilton Queiroz, J.; Macedo e Silva, V. P.; Jeronimo, S. M.	2016	Journal Medical of Entomology Volume 43(5). Pages 990–995.	Effect of abiotic factors on seasonal population dynamics of *Lutzomyia longipalpis* (Diptera: Psychodidae) in Northeastern Brazil.	Brazil	Municipality		Male density Female density	Humidity Rainfall Temperature Humidity Rainfall Temperature	Negative significant Not correlated Not correlated Negative significant Correlated significant Correlated significant
164	Leptospirosis	Vanasco, N. B.; Sequeira, G.; Dalla Fontana, M. L.; Fusco, S.; Sequeira, M. D.; Enría, D.	2000	Rev Panam Salud Publica. Volume 7(1). Pages 35–40.	Descripción de un brote de leptospirosis en la ciudad de Santa Fe, Argentina, marzo–abril de 1998.	Argentina	Municipality		Outbreak	Floods Rainfall	Positive qualitative
165	Leptospirosis	Costa, E.; Costa, Y.; Aragão Lopes, A. A. S.; Sacramento, E.; Bina, J. C.	2001	Revista da Sociedade Brazileira de Medicina Tropical. Volume 34(3). Pages 261–267.	Formas graves de leptospirose: aspectos clínicos, demográficos e ambientais.	Brazil	Municipality		Number of hospitalized	Rainfall	Positive qualitative
166	Leptospirosis	Barcellos, C.; Chagastelles Sabroza, P.	2001	Cad. Saúde Pública. Volume 17. Pages 59–67.	The place behind the case: leptospirosis risks and associated environmental conditions in a flood-related outbreak in Rio de Janeiro.	Brazil	Municipality		Incidence	Inside flood risk área - Outside flood risk area	Different significantly

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
167	Leptospirosis	Romero, E. C.; Bernardo, C. C. M.; Yasuda, P. H.	2003	Rev. Inst. Med. Trop. Volume 45(5). Pages 245–248.	Human leptospirosis: A twenty-nine-year serological study in Sao Paulo, Brazil.	Brazil	State/Province		Number of cases	Rainfall	Description of the variable
168	Leptospirosis	Souza Tassinari, W.; da Cruz Payão Pellegrini, D.; Chagastelles Sabroza, P.; Sá Carvalho, M.	2004	Cad. Saúde Pública. Volume 20(6). Pages 1721–1729.	Distribuição espacial da leptospirose no município do Rio de Janeiro, Brazil, ao longo dos anos de 1996–1999.	Brazil	Municipality	X	Number of cases	Floods Rainfall	Description of the variable
169	Leptospirosis	Mineiro, A. L. B. B.; Bezerra, E. E. A.; Vasconcellos, S. A.; Costa, F. A. L.; Macedo, N. A.	2007	Arq. Bras. Med. Vet. Zootec. Volume 59(5). Pages 1103–1109.	Infecção por leptospira em bovinos e sua associação com transtornos reprodutivos e condições climáticas.	Brazil	State/Province		Prevalence of infection	Rainfall Temperature	Positive significant Not significant
170	Leptospirosis	Lacerda, H.G.; Monteiro, G. R.; Oliveira, C. C. G.; Suassuna, F. B.; Queiroz, J. W.; Barbosa, J. D. A.; Martinsa, D. R.; Reisb, M. G.; Kob, A. I.; Jeronimo, S. M. B.	2008	Trans R Soc Trop Med Hyg. Volume 102(12). Pages 1–10.	Leptospirosis in a subsistence farming community in Brazil.	Brazil	State/Province		Number of cases	Rainfall	Positive significant
171	Leptospirosis	Spinelli, T.; Soares, M.; Dias de Oliveira Latorre, M. R.; Zorello Laporta, G.; Buzzar, M. R.	2010	Rev Saúde Pública. Volume 44(2). Pages 1–9.	Spatial and seasonal analysis on leptospirosis in the municipality of São Paulo, southeastern Brazil, 1998 to 2006.	Brazil	Municipality	X	Number of cases	Rainy season Dry season	Different qualitative
172	Leptospirosis	Schelotto, F.; Hernandez, E.; Gonzalez, S.; Del Monte, A.; Ifran, S.; Flores, K.; Pardo, L.; Parada, D.; Filippini, M.; Balseiro, V.; Geymonati, J. P.; Varela, G.	2012	Rev. Inst. Med. Trop. Volume 54(2). Pages 69–75.	A ten- year follow-up of human leptospirosis in Uruguay: an unresolved health problema.	Uruguay	Country		Number of cases	Floods Rainfall	Positive qualitative

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
173	Leptospirosis	Vieira dos Santos de Oliveira, T.; Pinheiro Marinho, D.; Costa Neto, C.; Cynamon Kligerman, D.	2012	Ciência & Saúde Coletiva. Volume 17(6). Pages 1569–1576.	Variáveis climáticas, condições de vida e saúde da população: a leptospirose no município do Rio de Janeiro de 1996 a 2009.	Brazil	Municipality		Number of cases	Rainfall	Positive qualitative
174	Leptospirosis	Miyazato, E. K.; Fonseca, A. L. A.; Caputto, L. Z.; Rocha, K. C.; Azzalis, L. A.; Junqueira, V. B. C.; Pereira, E. C.; Chaves, L. C.; Feder, D.; Corazzini, R.; De Abreu, L. C.; Valenti, V. E.; Batista Lacerda, S. N.; Goulart, F. C.; Fonseca, F. L. A.	2013	International Archives of Medicine. Volume 6(23). Pages 1–7.	Incidence of Leptospirosis infection in the east zone of Sao Paulo city, Brazil.	Brazil	Municipality		Number of cases	Floods Rainfall	Positive qualitative
175	Leptospirosis	Mendonça Guimarães, R.; Gonçalves Cruz, O.; Gomes Parreira, V.; Lopes Mazoto, M.; Dias Vieira, J.; Ildes Rodrigues, C.; Asmus, F.	2014	Ciência & Saúde Coletiva. Volume 19(9). Pages 3683–3692.	Análise temporal da relação entre leptospirose e ocorrência de inundações por chuvas no município do Rio de Janeiro, Brazil, 2007–2012.	Brazil	Municipality		Number of cases	Rainfall	Positive qualitative
176	Leptospirosis	Dos Santos, D.; Da Rocha, M.; Filho, T.	2014	Revista Brazileira de Meteorologia. Volume 29(3). Pages 457–467.	Estudo sobre a influencia de variaveis meteorologicas em internacoes hospitalarias em Maceio durante o periodo 1998 a 2006.	Brazil	Municipality		Number of hospitalized	Humidity Rainfall Temperature	Positive qualitative
177	Leptospirosis	Gracie, R.; Barcellos, C.; Magalhães, M.; Souza-Santos, R.; Guimarães Barrocas, R. P.	2014	Int. J. Environ. Res. Public Health. Volume 11. Pages 10,366–10,383.	Geographical scale effects on the analysis of Leptospirosis determinants.	Brazil	Country	X	Geographical scale	Floods	Different qualitative

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
178	Leptospirosis	Alves Tavares de Souza, A.; Cardoso Ferreira, F.; Dutra Rezende, H.; Fulgêncio de Lima Arruda, J.; Macêdo da Silva Eça, P.	2014	Rev Med Minas Gerais. Volume 24(2). Pages 152–156.	Seasonal variation and clinical and epidemiological aspects of human leptospirosis in the city of Itaperuna – RJ.	Brazil	Municipality		Number of cases	Floods	There is no correlation qualitative
179	Leptospirosis	Lacerda, S. D. F. R.; Valadão, R. C.; Confalonieri, U. E.; Müller, G. V.; Quadro, M. F. L	2015	Revista Brasileira de Geografia Médica e da Saúde, Hygeia. Volume 11(20). Pages 106–126.	A Influência da Variabilidade da Precipitação no Padrão de Distribuição dos Casos de Leptospirose em Minas Gerais no Período de 1998 a 2012.	Brazil	State/Province		Number of cases	Rainfall	Positive qualitative
180	Malaria	Russac, P.	1986	Disasters. Volume 10(2). Pages 112–117.	Epidemiological surveillance: Malaria epidemic following the Nino phenomenon	Peru	Municipality		Number of cases	El Niño	Positive qualitative
181	Malaria, *Anopheles neiva*	Murillo, C. B.; Astaiza, R. V.; Fajardo, P. O.	1988	Rev. Saud. Publ. Sao Pablo. Volume 22(2). Pages 94–100.	Biologia de *Anopheles* (kerteszia) *neiva* H., D. & K., 1913 (Diptera: Culicidae) en la costa pacifica de Colombia.	Colombia	Municipality		Larval population	Rainfall	Negative qualitative
182	Malaria, *Anopheles darlingi*	Rozendaal, J. A.	1990	Memórias do Instituto Oswaldo Cruz, Jun 1990. Volume 85(2). Pages 221–234.	Observations on the distribution of anophelines in Suriname with particular reference to the malaria vector *Anopheles darlingi.*	Suriname	Country		Number of cases	Rainy season Dry season	Different qualitative
183	Malaria, *Anopheles aquasalis*	Flores-Mendoza, C.; Lourenço-de-Oliveira, R.	1996	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 91(3). Pages 265–270.	Bionomics of *Anopheles aquasalis* Curry 1932, in Guaraí, state of Rio de Janeiro, southeastern Brazil-I. Seasonal distribution and parity rates.	Brazil	Municipality		Density	Rainfall	There is no correlation
184	Malaria, Anopheles	Macário Rebêlo, J. M.; da Silva, A. R.; Alves Ferreira, L.; Vieira, J. A.	1997	Revista da Sociedade Brasileira de Medicina Tropical.Volume 30(2). Pages 107–111.	Anopheles (culicidae, anophelinae) e a malária em buriticupu-santa luzia, pré amazonia maranhense.	Brazil	Municipality		Abundance	Rainy season Dry season	Different qualitative
185	Malaria	Bourna, M. J.; Poveda, G.; Rojas, W.; Chavasse, D.; Quiiiones, M.; Cox, J.; Patz, J.	1997	Tropical Medicine and International Health. Volume 2(12). Pages 1122–1127.	Predicting high-risk years for malaria in Colombia using parameters of El Niño Southern Oscillation.	Colombia	Country		Number of cases	El Niño	Positive qualitative

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
186	Malaria, Anopheles	San Sebastián, M.; Játiva, R.; Goicolea, I.	2000	Rev Panam Salud Publica/Pan Am J Public Health. Volume 7(1). Pages 24–28.	Epidemiology of malaria in the Amazon basin of Ecuador.	Ecuador	Municipality		Incidence	Rainfall Temperature	There is no correlation
187	Malaria	Poveda, G.; Rojas, W.;. Quiñones, M. L.; Vélez, I. D.; Mantilla, R. I.; Ruiz, D.; Zuluaga, J. S.; Rua, G. L.	2001	Environmental Health Perspectives. Volume 109(5). Pages 489–493.	Coupling between Annual and ENSO Timescales in the Malaria–Climate Association in Colombia.	Colombia	Municipality		Number of cases	El Niño	Positive quantitative
188	Malaria, Anopheles	Guthmann, J. P.; Llanos-Cuentas, A.; Palacios, A.; Hall, A. J.	2002	Tropical Medicine and International Health. Volume 7(6). Pages 518–525.	Environmental factors as determinants of malaria risk. A descriptive study on the northern coast of Peru.	Perú	Municipality		Number of cases	Rainfall	Positive qualitative
189	Malaria, Anopheles	Gagnon, A. S.; Smoyer-Tomic, K. E; Bush, A. B. G.	2002	Int J Biometeorol. Volume 46. Pages 81–89.	The El Niño Southern Oscillation and malaria epidemics.	Colombia,	Country		Number of cases	ENSO	Positive qualitative
190	Malaria, *Anopheles darlingi*	León, W.; Valle, J.; Naupay, R.; Tineo, E.; Rosas, A.; Palomino, M.	2003	Rev Peru Med Exp Salud Publica. Volume 20(1). Pages 22–27.	Comportamiento estacional del *Anopheles* (Nyssorhynchus) Root 1926 en localidades de Loreto y Madre de Dios, Perú 1999–2000.	Perú	Municipality		Sting index	Rainy season Dry season	Different qualitative
191	Malaria, *Anopheles darlingi*	Tineo, E.; Medina, A.; Fallaque, C.; Chávez, L.; Quispe, S.; Mercado, M.; Zevallos, J.; León, W.; Palomino, M.	2003	Rev Peru Med Exp Salud Publica. Volume 20(2). Pages 78–83.	Distribución geográfica y comportamiento estacional de la picadura del *Anopheles* (Nyssorhynchus) *darlingi* Root 1926.	Perú	Municipality	X	Density	Rainy season	Positive qualitative
192	Malaria, Anopheles	Guimarães, A. E.; Gentile, C.; Alencar, J.; Macedo Lopes, C.; Pinto de Mello, R.	2004	Cad. Saúde Pública, Rio de Janeiro. Volume 20(1). Pages 291–302.	Ecology of anopheline (Diptera, Culicidae), malaria vectors around the Serra da Mesa Reservoir, state of Goiás, Brazil. Frequency and climatic factors.	Brazil	Municipality		Frequency of the anopheline species	Floods	Different qualitative

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
193	Malaria *Plasmodium falciparum*	Ruiz, D.; Poveda, G.; Vélez, I. D.; Quiñones, M. L.; Rúa, G. L.; Velásquez, L. E.; Zuluaga, J. S.	2006	Malaria Journal. Volume 5(66). Pages 1–30.	Modelling entomological-climatic interactions of *Plasmodium falciparum* malaria transmission in two Colombian endemic-regions: contributions to a National Malaria Early Warning System.	Colombia	Municipality		Malaria transmission	Temperature El Niño	Explanatory variables
194	Malaria, Anopheles	Mariko Ueno, H.; Forattini, O. P.M; Kakitani, I.	2007	Rev Saúde Pública. Volume 41(2). Pages 269–275.	Distribuição vertical e sazonal de Anopheles (Kerteszia) em Ilha Comprida, SP.	Brazil	Municipality		Density	Rainfall Temperature	There is no correlation Positive significant
195	Malaria, Anopheles	Soares Gil, L. H.; Shugiro Tada, M.; Hiroshi Katsuragawa, T.; Martins Ribolla, P. E.; Hildebrando Pereira da Silva, L.	2007	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 102(3). Pages 271–276.	Urban and suburban malaria in Rondônia (Brazilian Western Amazon) II. Perennial transmissions with high anopheline densities are associated with human environmental hanges.	Brazil	State/Province		Density	Rainy season Dry season	Different qualitative
196	Malaria, Anopheles	Magris, M.; Rubio-Palis, Y.; Menares, C.; Villegas, L.	2007	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 102(3). Pages 303–311.	Vector bionomics and malaria transmission in the Upper Orinoco River, Southern Venezuela.	Venezuela	Municipality		Number of vectors Incidence	Rainfall	Not significant
197	Malaria	Sáez-Sáez, V.; Martínez, J.; Rubio-Palis, Y.; Delgado, L.	2007	Bol Mal Salud Amb. Volume 47(2). Pages 177–189.	Evaluación semanal de la relación malaria, precipitación y temperatura del aire en la Península de Paria, estado Sucre, Venezuela.	Venezuela	Municipality		Incidence	Rainfall Temperature	Positive significant
198	Malaria, *Anopheles darlingi*	Zeilhofer, P.; Soares dos Santos, E.; Ribeiro, A. L. M.; Miyazaki, R. M.; Atanaka dos Santos, M.	2007	International Journal of Health Geographics. Volume 6. Pages 1–14.	Habitat suitability mapping of *Anopheles darlingi* in the surroundings of the Manso hydropower plant reservoir, Mato Grosso, Central Brazil.	Brazil	Municipality	X	Incidence	Rainy season Dry season	There are not different

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
199	Malaria, *Anopheles darlingi*	Berti-Moser, J.; González-Rivas, J.; Navarro, E.	2008	Boletin de mariologia y salud ambiental. Volume XLVIII(2). Pages 177–189.	Fluctuaciones estacionales y temporales de la densidad larvaria de *Anopheles darlingi* Root (Diptera: Culicidae) y familias de insectos asociados al hábitat en El Granzón, Parroquia San Isidro, municipio Sifontes del estado Bolívar, Venezuela.	Venezuela	Municipality		Abundance	Rainfall	Negative significant
200	Malaria, Anopheles	Girod R., Gaborit P., Carinci R., Issaly J., Fouque F.	2008	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 103(7). Pages 702–710.	Anopheles darlingi bionomics and transmission of *Plasmodium falciparum, Plasmodium vivax and Plasmodium* malariae in Amerindian villages of the Upper-Maroni Amazonian forest, French Guiana.	French Guiana	Municipality		Abundance	Rainfall	Positive qualitative
201	Malaria, Anopheles	Mascarenhas, B. M.; Guimaraes, D. G.; Brigida, M. S.; Pinto, C. S.; Gomes Neto, E. A.; Braga Pereora, J. D.	2009	Acta Amazonica. Volume 39(2). Pages 453–458.	Estudo de anofelinos antropofílicos peridomiciliares da Praia da Saudade na Ilha de Cotijuba: uma área endêmica de malária em Belém, Pará.	Brazil	Municipality		Number of anofelinos	Rainfall Temperature	Positiva qualitative Negative qualitative
202	Malaria, Anopheles	Dantur Juri, M. J.; Zaidenberg, M.; Claps, G. L.; Santana, M.; Almirón, W. R.	2009	Malaria Journal. Volume 8. Pages 1–10.	Malaria transmission in two localities in north-western Argentina.	Argentina	Municipality		Density	Rainfall Temperature	Negative significant Positive significant
203	Malaria	Mantilla, G.; Oliveros, H.; Barnston, A. G.	2009	Malaria Journal. Volume 8. Pages 1–11.	The role of ENSO in understanding changes in Colombia's annual malaria burden by region, 1960–2006.	Colombia	Country		Number of cases	ENSO	Significant predictor
204	Malaria, Anopheles	Coutinho Meneguzzi, V.; Biral dos Santos, C.; de Souza Pinto, I.; Feitoza, L. R.; Nagatani Feitoza, H.; Falqueto, A.	2009	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 104(4). Pages 570–575.	Use of geoprocessing to define malaria risk areas and evaluation of the vectorial importance of anopheline mosquitoes (Diptera: Culicidae) in Espírito Santo, Brazil.	Brazil	State/Province	X	Malaria foci	Temperature	Positive significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
205	Malaria	Metzger, W. G.; Giron, A. M.; Vivas-Martínez, S.; González, J.; Charrasco, A. J.; Mordmüller, B. G.; Magris, M.	2009	Malaria Journal. Volume 8. Pages 1–14.	A rapid malaria appraisal in the Venezuelan Amazon.	Venezuela	State/Province		Malaria transmission Incidence of *P. vivax* Incidence of *P. falciparum*	Rainfall	Positive significant Positive significant Positive significant
206	Malaria	Ramal, C.; Vásquez, J.; Magallanes, J.; Carey, C.	2009	Rev Peru Med Exp Salud Publica. Volume 26(1). Pages 9–14.	Variabilidad climática y transmisión de Malaria en Loreto, Perú: 1995–2007.	Peru	State/Province		Cases of malaria	Rainfall River level Temperature	Not significant Negative significant Negative significant
207	Malaria, Anopheles	Chowell, G.; Munayco, C. V.; Escalante, A. A.; McKenzie, F. E.	2009	Malaria Journal. Volume 8. Pages 1–19.	The spatial and temporal patterns of *falciparum* and *vivax* malaria in Perú: 1994–2006.	Peru	Country	X	Incidence	Rainfall Temperature	Positive significant
208	Malaria	Santos Silva, J.; Barreto Pacheco, J.; Alencar, J.; Guimarães, A. E.	2010	Mem Inst Oswaldo Cruz. Volume 105(2). Pages 155–162.	Biodiversity and influence of climatic factors on mosquitoes (Diptera: Culicidae) around the Peixe Angical hydroelectric scheme.	Brazil	State/Province		Abundance *An. albitarsis* Abundance *Ch. fajardi* Abundance *Cx. nigripalpus, Hg. janthinomys, Ps. albipes, Ps. ferox and Sa. glaucodaemon* Abundance *An. albitarsis, An. triannulatus* Abundance *Hg. janthinomys, Li. durhami, Ps. ferox, Sa. Glaucodaemon, Sa. Intermedius*	Temperature Humidity Rainfall	Positive significant Negative significant Positive significant Negative significant Positive significant
209	Malaria, *Anopheles aquasalis*	Berti, J.; González, J.; Navarro-Bueno, E.; Zoppi, E.; Gordon, E.; Delgado, L.	2010	Rev. Biol. Trop. Volume 58(2). Pages 777–787.	Estacionalidad de la densidad larval del mosquito *Anopheles aquasalis* (Diptera: Culicidae) y otros insectos asociados a su hábitat en Sucre, Venezuela.	Venezuela	State/Province		Larvae abundance	Rainfall	Negative significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
210	Malaria, Anopheles	Dantur Juri, M. J.; Almirón, W. R.; Claps, G. L.	2010	Journal of Vector Ecology. Volume 35(1). Pages 28–34.	Population fuctuation of Anopheles (Diptera: Culicidae) in forest and forest edge habitats in Tucumán province, Argentina.	Argentina	Municipality		Anopheline development	Season	Different qualitative
211	Malaria, Anopheles	Navarro, J. C.; Del Ventura, F.; Zorrilla, A.; Liria, J.	2010	Rev. Biol. Trop. Volume 58(1). Pages 245–254.	Registros de mayor altitud para mosquitos (Diptera: Culicidae) en Venezuela.	Venezuela	Country		Presence of species	Altitude	Upper limits
212	Malaria	Muñoz, M.; Villarroel, J. E.; Scavuzzo, M.; Lanfri, M.; Cousiño, B.; Guido, C.; Russomando, G.	2011	Acta Biol. Venez. Volume 31(2). Pages 17–21.	Spatial- temporal anaysis of malaria endemic areas of Paraguay, 2002–2006.	Paraguay	State/Province	X	Annual Parasitic Index	Altitude Rainfall Temperature	Spatial-temporal analysis
213	Malaria	Hanf, M.; Adenis, A.; Nacher, M.; Carme, B.	2011	Malaria Journal. Volume 10(100). Pages 1–4.	The role of El Niño southern oscillation (ENSO) on variations of monthly *Plasmodium falciparum* malaria cases at the cayenne general hospital, 1996–2009, French Guiana.	French Guiana	Country		Number of cases	El Niño	Positive significant
214	Malaria	Mateus, J. C.; Carrasquilla, G.	2011	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 106(I). Pages 107–113.	Predictors of local malaria outbreaks: an approach to the development of an early warning system in Colombia.	Colombia	Municipality		Outbreaks	Rainfall	Positive significant
215	Malaria, Anopheles	Stefani, A.; Hanf, M.; Nacher, M.; Girod, R.; Carme, R.	2011	Malaria Journal. Volume 10. Pages 1–12.	Environmental, entomological, socioeconomic and behavioural risk factors for malaria attacks in Amerindian children of Camopi, French Guiana.	French Guiana	Municipality		Incidence	Rainfall River level Temperature	Positive or negative significant depending on the months of the year
216	Malaria	Basurko, C.; Hanf, M.; Han-Sze, R.; Rogier, S.; Héritier, P.; Grenier, C.; Joubert, M.; Nacher, M.; Carme, B.	2011	Malaria Journal. Volume 10. Pages 1–7.	Influence of climate and river level on the incidence of malaria in Cacao, French Guiana.	French Guiana	Municipality		Incidence	Rainfall |River level Temperature	Positive significant Positive significant Positive significant

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
217	Malaria, *Anopheles darlingi*	Girod, R.; Roux, E.; Berger, F.; Stefani, A; Gaborit P., Carinci R., Issaly J., Carme B., Dusfour I.	2011	Annals of Tropical Medicine & Parasitology. Volume 105(2). Pages 107–122.	Unravelling the relationships between *Anopheles darlingi* (Diptera: Culicidae) densities, environmental factors and malaria incidence: understanding the variable patterns of malarial transmission in French Guiana (South America).	French Guiana	Municipality		Human biting rates Camopi Human biting rates Apatou Human biting rates Régina	Rainy season Rainfall Water levels Rainy season Rainfall Water levels Rainy season Rainfall Water levels	Positive significant Not significant Positive significant Not significant Not significant
218	Malaria, *Anopheles darlingi*	Saito Monteiro de Barros, F.; Alves Honorio, N.; Arruda, M. E.	2011	Plos One. Volume 6(8). Pages 1–13.	Survivorship of *Anopheles darlingi* (Diptera: Culicidae) in relation with Malaria incidence in the Brazilian amazon.	Brazil	Municipality		Daily survival rates	Rainy days	Negative significant
219	Malaria, *Anopheles argyritarsis A. pseudopunctipennis*	Lardeux, F.; Aliaga, C.; Tejerina, R.; Torrez, L.	2013	Malaria Journal. Volume 12. Pages 1–14.	Comparison of transmission parameters between *Anopheles argyritarsis* and *Anopheles pseudopunctipennis* in two ecologically different localities of Bolivia.	Bolivia	Municipality		Abundance *A.argyritarsis* in Matarral Abundance *A. pseudopunctipennis* in Matarral Abundance *A.argyritarsis* in Caiza Abundance *A. pseudopunctipennis* in Caiza	Rainfall Rainfall	Positive qualitative Positive qualitative Negative significant Positive significant
220	Malaria	Moreno, J. E.; Rubio-Palis, Y.; Martínez, A. R.; Acevedo, P.	2014	Boletin de Mariologia y Salud Ambiental. Volume LIV(2). Pages 236–249.	Evolución espacial y temporal de la malaria en el municipio Sifontes del estado Bolívar, Venezuela 1980–2013.	Venezuela	Municipality	X	Outbreaks	Rainfall	Not significant
221	Malaria, Anopheles	Pessôa Guedes, M. L.; Navarro-Silva, M. A.	2014	Revista Brazileira de Entomologia. Volume 58(1). Pages 88–94.	Mosquito community composition in dynamic landscapes from the Atlantic Forest biome (Diptera, Culicidae).	Brazil	Municipality		Frequency	Rainfall Temperature Humidity	There is no correlation
222	Malaria, Anopheles	Naranjo-Dıaz, N.; Altamiranda, M.; Luckhart, S.; Conn, J. E.; Correa, M. M.	2014	Plos One. Volume 9(8). Pages 1–9.	Malaria vectors in ecologically heterogeneous localities of the Colombian Pacific region.	Colombia	Municipality		Abundance and diversity	Rainfall	Positve qualitative

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
223	Malaria, Anopheles	Valle, D.; Tucker Lima, J. M.	2014	Malaria Journal. Volume 13. Pages 1–13.	Large-scale drivers of malaria and priority areas for prevention and control in the Brazilian Amazon region using a novel multi-pathogen geospatial model.	Brazil	Municipality	X	Malaria risk	Dry season	Positive significant
224	Malaria, Anopheles	Dantur Juri, M. J.; Galante, G. B.; Zaidenberg, M.; Almirón, W. R.; Claps, G. L.; Santana, M.	2014	Florida Entomologist. Volume 97(3). Pages 1167–1181.	Longitudinal study of the species composition and spatio-temporal abundance of anopheles larvae in a malaria risk area in Argentina.	Argentina	Municipality	X	Abundance	Seasonality Temperature	Different cuallitative Positive significant
225	Malaria	Alimi, T. O.; Fuller, D. O.; Qualls, W. A.; Herrera, S. V.; Arevalo-Herrera, M. A.; Quinones, M. L.; Lacerda, M. V. G.; Beier, J. C.	2015	Parasites & Vectors. Volume 8(431). Pages 1–16.	Predicting potential ranges of primary malaria vectors and malaria in northern South America based on projected changes in climate, land cover and human population.	Bolivia, Brazil, Colombia,	Country		Ranges of primary malaria vectors	Altitude Rainfall Temperature	Were influential
226	Malaria, Anopheles	Moreno, J. E.; Rubio-Palis, Y.; Sánchez, V.; Martínez, A.	2015	Boletin de mariologia y salud ambiental. Volume LV(1). Pages 52–68.	Fluctuación poblacional y hábitat larval de anofelinos en el municipio Sifontes, estado Bolívar, Venezuela.	Venezuela	Municipality		Abundance of larvae in lentic bodies of water Abundance of larvae in bodies of running water	Rainfall	Not significant Negative significant
227	Malaria		2016	Boletin Epidemiológico Lima. 35. Ministerio de Salud. Peru		Peru	Country		Number of malaria cases	El Niño	Positive qualitative
228	Malaria	Alimi, T. O.; Fuller, D. O.; Herrera, S. V.; Arevalo-Herrera, M.; Quinones, M. L.; Stoler, J. B.; Beier, J. C.	2016	BMC Public Health. Volume 16. Pages 1–10.	A multi-criteria decision analysis approach to assessing malaria risk in northern South America.	Colombia, Ecuador, French	Country		Malaria risk	Altitude Rainfall Temperature	Were influential
229	Schistosomiasis	da Silva Ramos, A.; de Toledo Piza, J.; Froes, E.	1970	Rev. Saúde púb., S. Paulo. Volume 4(1). Pages 1–5.	A importancia das inundacoes na expansao da Esquitossomose mansoni.	Brazil	Municipality		Expansion of Esquitossomose mansoni	Floods	Positive qualitative

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
230	Schistosomiasis, *Biomphalaria tenagophila*	Baptista, D. F.; Vasconcelos, M. C.; Schall, V. T.	1989	Mem. Inst. Oswaldo Cruz. Volume 84(3). Pages 325–332.	Study of a population of *Biomphalaria tenagophila* (Orbigny, 1835) and of schistosomiasis transmission in "Alto da Boa Vista", Rio de Janeiro.	Brazil	Municipality		Density	Rainfall Temperature	Descriptive
231	Schistosomiasis, *Biomphalaria glabrata*	Giovanellia, A.; Soaresa, M. S.; D'Andréab, P. S.; Lessa Gonçalvesa, M. M.; Reyb, L.	2001	Rev Saúde Pública. Volume 35(6). Pages 523–530.	Abundância e infecção do molusco *Biomphalaria glabrata* pelo Schistosoma mansoni no Estado do Rio de Janeiro, Brazil.	Brazil	Municipality		Abundance	Rainfall	Negative significant
232	Schistosomiasis	Simões Barbosa, C.; Coutinho Domingues, A. L.; Abath, F.; Lucena Montenegro, S. M.; Guida, U.; Carneiro, J.; Tabosa, B.; Lins de Moraes, C. N.; Spinelli, V.	2001	Cad. Saúde Pública, Rio de Janeiro. Volume 17(3). Pages725-728.	Epidemia de esquistossomose aguda na praia de Porto de Galinhas, Pernambuco, Brazil.	Brazil	Municipality		Outbreak	Floods Rainfall	Positive qualitative
233	Schistosomiasis	Barbosa, C. S.; Montenegro, S. M. L.; Abath, F. C.; Coutinho Domingues, A. L.	2001	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 96. Pages 169–172.	Specific situations related to acute Schistosomiasis in Pernambuco, Brazil.	Brazil	State/Province		Cases of Schistosomiasis	Floods	Descriptive
234	Schistosomiasis	Guimarães, R. J. P. S.; Freitas, C. C.; Dutra, L. V.; Moura, A. C. M.; Amaral, R. S.; Drummond, S. S.; Guerra, M.; Scholte, R. G. C.; Freitas, C. R.; Carvalho, O. S.	2006	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 101(I). Pages 91–96.	Analysis and estimative of schistosomiasis prevalence for the state of Minas Gerais, Brazil, using multiple regression with social and environmental spatial data.	Brazil	State/Province	X	Schistosomiasis prevalence	Temperature	Was influential

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	Illnes/Vector	Authors	Year	Journal name	Publication title	Country	Scale of the studio area	Spacial and temporal methods	Biological variable	Phenomenon or variable	Relationship with the variable or method
235	Schistosomiasis	Souza Guimarães, P. R. J.; Costa Freitas, C.; Vieira Dutra, L.; Carvalho Scholte, R. G.; Toledo Martins-Bedé, F.; Rodrigues Fonseca, F.; Santos Amaral, R.; Costa Drummond, S.; Felgueiras, C. A.; Corrêa Oliveira, G.; Santos Carvalho, O.	2010	Mem Inst Oswaldo Cruz, Rio de Janeiro. Volume 105(4). Pages 524–531.	A geoprocessing approach for studying and controlling schistosomiasis in the state of Minas Gerais, Brazil.	Brazil	State/Province	X	Schistosomiasis risk	Rainfall Temperature	Were influential
236	Schistosomiasis	Batista Leal Neto, O.; Christine de Souza Gomes, E.; Moreira de Oliveira Junior, F. J.; Andrade, R.; Reis, D. L., Souza-Santos, R.; Bocanegra, S.; Simões Barbosa, C.	2013	Cad. Saúde Pública, Rio de Janeiro. Volume 29(2). Pages 357–367.	Biological and environmental factors associated with risk of schistosomiasis mansoni transmission in Porto de Galinhas, Pernambuco State, Brazil.	Brazil	Municipality		Snail density and infection rate Breeding site	Rainfall Temperature	Positive significant Negative significant
237	Schistosomiasis, Biomphalaria	Santos Oliveira, D.; Bispo Santos, V.; Gomes Santana Melo, A.; Silva Lima, A.; Dantas Carvalho, C.; Marques Allegretti, S.; Moura de Melo, C.; Riscala Madi, R.; Sierpe Jeraldo, V. L.	2013	Revista da Sociedade Brazileira de Medicina Tropical. Volume 46(5). Pages 654–657,	Schistosomiasis mansoni in urban northeast Brazil: influence of rainfall regime on the population dynamics of Biomphalaria sp.	Brazil	Municipality		Abundance	Rainfall	Positive qualitative
238	Schistosomiasis	Dos Santos, D.; Da Rocha Toledo Filho, M.	2014	Revista Brazileira de Meteorologia. Volume 29(3). Pages 457–467.	Estudo sobre a influencia de variaveis meteorologicas em internacoes hospitalares em Maceio-Al, durante o periodo 1998 a 2006.	Brazil	Municipality		Internacoes hospitalares	Humidity Rainfall Temperature	Positive cunatitative Positive quantitative Positive quantitative
239	Schistosomiasis, *Biomphalaria tenagophila, B. straminea*	Gardini Sanches Palasio, R.; Oliveira Casotti, M.; Cassia Rodrigues, T.; Tirone Menezes, R. M.; Zanotti-Magalhaes, E. M.; Tuan, R.	2015	Biota Neotropica. Volume 15(3). Pages 1–6.	The current distribution pattern of *Biomphalaria tenagophila* and *Biomphalaria straminea* in the northern and southern regions of the coastal fluvial plain in the state of Sao Paulo.	Brazil	Municipality	X	Distribution pattern	Rainfall Temperature	Were influential

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Berti-Moser J, González-Rivas J, Navarro E. Fluctuaciones estacionales y temporales de la densidad larvaria de Anopheles darlingi Root (Diptera: Culicidae) y familias de insectos asociados al hábitat en El Granzón, Parroquia San Isidro, municipio Sifontes del estado Bolívar, Venezuela. Boletin de mariologia y salud ambiental 2008;XLVIII(2):177–89.

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