

One Health and climate suitability: shifting frontiers of dengue and leishmaniasis in the subtropical and temperate areas of the Southern Cone

Saúde Única e adequação climática: transposição fronteira de dengue e leishmaniose nas áreas temperadas e subtropicais do Cone Sul

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ABSTRACT

Changes in the distribution of climate suitability and interannual meteorological variability are central to the reconfiguration of Neglected Tropical Disease (NTD) transmission in ecological transition zones. This study synthesizes evidence regarding the recent intensification of dengue and the southward expansion of leishmaniasis in southern Brazil, examining the convergence of environmental suitability, urban infrastructure, and cross-border connectivity through the lens of One Health. SciELO, Google Scholar, and PubMed databases were searched using local and regional (Southern Cone) descriptors to map epidemiological dynamics and vector distribution models up to August 2025. Spatiotemporal data demonstrate a progressive erosion of historical thermal barriers (cold winters) in southern Brazil, accompanied by increased *Aedes aegypti* infestation and the persistence of viral lineages throughout the winter. This pattern is linked to cross-border population mobility and autumn climate dynamics in adjacent temperate regions of the Southern Cone (Argentina/Uruguay), which exert bidirectional pressure regarding disease importation. Evidence confirms the southward spread of *Lutzomyia longipalpis* and *Migonomys migonei*. New operational challenges regarding diagnosis and surveillance are emerging. Fully operationalizing the One Health triad is essential to enhance health system resilience and guide timely, interoperable, and cross-border public policies.

Keywords: climate change, transboundary surveillance, vector-borne diseases.

RESUMO

As mudanças na distribuição da adequação climática e a variabilidade meteorológica interanual são centrais na reconfiguração da transmissão de doenças tropicais negligenciadas (DTNs) em áreas de borda ecológica. Sintetizam-se aqui evidências sobre a intensificação recente da dengue e a expansão meridional da leishmaniose no Sul do Brasil, examinando a convergência entre adequação ambiental, infraestrutura urbana e conectividade transfronteira, na ótica de Saúde Única. Foram verificadas as bases de dados SciELO, Google Scholar e PubMed, utilizando descritores locais e regionais (Cone Sul), para mapear a dinâmica epidemiológica e os modelos de distribuição vetorial até agosto de 2025. Dados espaçotemporais demonstram uma erosão progressiva das barreiras térmicas históricas (invernos frios) no Sul do Brasil, com aumento da infestação por *Aedes aegypti* e persistência de linhagens virais ao longo do inverno. Esse padrão está acoplado à mobilidade populacional transfronteira e à dinâmica climática de outono, em regiões temperadas adjacentes do Cone Sul (Argentina/Uruguai), que exercem pressão bidirecional de importação. Evidências confirmam o avanço meridional de *Lutzomyia longipalpis* e *Migonomys migonei*. Novos desafios operacionais para diagnóstico e vigilância impõem-se. A operacionalização plena da tríade de Saúde Única é fundamental para ampliar a resiliência dos sistemas de saúde e orientar políticas públicas oportunas, interoperáveis e transfronteiriças.

Palavras-chave: doenças transmitidas por vetores, mudança climática, vigilância transfronteira.

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INTRODUCTION

The recent climate emergency has rapidly reconfigured the environmental determinants of arbovirus transmission by increasing thermal suitability and altering precipitation regimes that condition the survival, abundance, and seasonality of mosquito vectors, even in areas historically marginal for transmission (ROBERT *et al.*, 2020). In particular, evidence indicates that the geographic expansion and intensification of arboviruses transmitted by *Aedes* are associated with environmental changes consistent with warming and greater climate variability, with records of emergence in latitudes and zones previously considered less propitious (LOURENÇO-DE-OLIVEIRA *et al.*, 2013). In this scenario, a One Health approach becomes operationally relevant when oriented toward the environment–vector–society triad: (i) climate change and environmental suitability (environmental component); (ii) vector expansion and establishment (animal component, in terms of arthropod vector ecology and dynamics); and (iii) human urbanization, infrastructure, and connectivity (human component), which modulate breeding sites, pathogen circulation, and socio-spatial vulnerabilities (BERMANN *et al.*, 2025). In Brazil, this interdependence is compatible with findings that outbreak occurrences and the expansion of dengue-endemic areas are associated with climatic conditions (temperature), urbanization, and urban network connectivity, signaling that the transmission frontier is dynamic and highly sensitive to socio-environmental determinants (OLIVEIRA *et al.*, 2023).

Beyond climate, macro-structural processes, such as human mobility, rapid urbanization, and environmental transformations, create enabling conditions for vector-borne disease transmission by connecting high-incidence areas to territories with lower population immunity and surveillance systems less adapted to this new reality (WILSON *et al.*, 2020). In temperate regions of the Southern Cone, for example, dengue dynamics have been described as strongly influenced by importation (case pressure from neighboring countries) combined with seasonal thermal conditions that favor vector persistence/resurgence and the occurrence of outbreaks (LÓPEZ *et al.*, 2021). This pattern is particularly important for the transition between global and regional scales, as it suggests that factors previously characteristic of tropical zones, such as intense regional circulation and urbanization with deficient public services, have begun to pressure subtropical borders and ecologically vulnerable areas, widening the seasonal risk window and facilitating the introduction and reintroduction of arboviruses and vectors (CARBAJO *et al.*, 2018).

In Southern Brazil, the introduction and expansion of *Aedes aegypti* and leishmaniasis vectors historically faced climatic barriers associated with seasonality and colder winters, which tend to limit environmental suitability for transmission during part of the year (CASALI *et al.*, 2019). However, specific analyses for the region show a significant increase in the presence and infestation of *A. aegypti* in southern municipalities, exhibiting a positive association with climatic variables (e.g., temperature, precipitation, humidity) and urban environmental/infrastructural components, which reinforces the practical erosion of these barriers in local contexts (CAVALCANTI *et al.*, 2016). In parallel, the regional dynamics of the Southern Cone indicate that transboundary flows and connectivity with neighboring countries are highly relevant to introduction pressure and spatial propagation: in temperate provinces of Argentina, proximity and connection to border areas linked to Brazil and Paraguay are pointed out as elements compatible with the southward spread of dengue via importation, within a context of recent emergence in temperate climates (LEE *et al.*, 2021). For visceral leishmaniasis, there is evidence of a southward expansion of the vector *Lutzomyia longipalpis* in the Southern Cone, with successive urban records in Argentina and recent detection in Uruguay, indicating a regional scenario of vector advancement and transboundary risk (GÓMEZ-BRAVO *et al.*, 2017). Potential distribution modelings have also anticipated (with the nuances and uncertainties inherent to models) the possibility of expansion into southern Brazil, backed by records of the vector in Rio Grande do Sul, suggesting that surveillance in subtropical zones must consider both historical climatic limitations and the permeability of borders, alongside the urban environmental heterogeneity that favors vector establishment (PETERSON *et al.*, 2017).

Therefore, this study proposes a narrative literature review on the epidemiological aspects and challenges imposed by climate change in combating dengue and leishmaniasis in Southern Brazil. By synthesizing and cross-referencing spatial evidence and socio-environmental factors described in the

scientific literature and technical documents, under a One Health lens oriented toward the climate change, vector expansion and urbanization/infrastructure and connectivity triad, this work aims to identify knowledge gaps and inform future public interventions in the region. This aligns with the critical need for evidence-based vector control strategies adapted to local determinants and ongoing environmental changes.

MATERIAL AND METHODS

This study consists of a narrative literature review, descriptive and exploratory in nature, designed to synthesize and cross-reference evidence on the epidemiological dynamics of dengue and leishmaniasis in Southern Brazil under a One Health perspective and in the context of ongoing climate change. The bibliographic survey was conducted in the electronic databases SciELO, Google Scholar, and PubMed. To capture both local realities and macro-regional pressures, the search strategy utilized descriptors such as “Dengue”, “Leishmaniasis”, “Climate Change”, “Santa Catarina”, “Paraná”, “Rio Grande do Sul”, “Brazil”, “Southern Cone”, “Argentina”, “Uruguay”, and “One Health”, as well as their correlates in Portuguese, combined by the Boolean operators “AND” and “OR” to refine and expand data retrieval.

Eligibility criteria prioritized original articles, systematic reviews, and official technical documents available in full text in Portuguese and English, covering the period from September 2011 to August 2025. This timeframe was selected to encompass recent literature regarding climate-driven vector invasion, transboundary demographic flows, and emerging diagnostic technologies. The final selection, based on critical reading and thematic pertinence, resulted in an integrative sample of publications that allowed for the synthesis of climatic, socioeconomic, and spatial data. This framework grounds an interdisciplinary discussion on the challenges of epidemiological surveillance and health system resilience in subtropical zones. Institutional ethics committee approval was not required as this study relies exclusively on the analysis of secondary, publicly available literature.

RESULTS AND DISCUSSION

INTERSECTION BETWEEN CLIMATE AND NEGLECTED TROPICAL DISEASES

The climate emergency and interannual climate variability constitute a central explanatory axis for understanding the intensification and spatial expansion of vector-borne NTDs, especially dengue and leishmaniasis. This is because they directly affect entomological and ecological parameters – such as survival, development, seasonal activity, and vector competence – and, consequently, transmission dynamics (CAMPBELL *et al.*, 2015). Empirical and modeling evidence indicates that temperature and precipitation (including their extremes) modulate climate suitability for *Aedes aegypti* and other vectors. This influences the probability of establishment and the seasonal transmission window, even in climate boundary areas, such as temperate and subtropical regions (BOUZID *et al.*, 2014). In studies evaluating dengue outbreaks and expansion, climatic and non-climatic factors (urbanization and connectivity) appear integrated as determinants, reinforcing the need for a socio-ecological, rather than an exclusively meteorological, interpretation of risk (BHATT *et al.*, 2013).

Climate events and large-scale oscillations are also associated with alterations in dengue transmission dynamics. Specifically, it has been described that climate anomalies linked to interannual variability can influence the incidence and magnitude of epidemics by altering environmental conditions that favor the vector and transmission (ROTH *et al.*, 2014). Furthermore, evidence suggests that under climate change, the invasion potential of *Aedes aegypti* tends to accelerate, indicating a higher risk of vector colonization and persistence in new territories when thermal and hydric conditions become more favorable (FONSECA, 2023). Critical reviews of modeling also indicate that climate projections, when integrated with social and ecological determinants, are essential for estimating future risk and guiding surveillance and control (CAVALIERE *et al.*, 2014).

From an environmental-historical perspective, the literature highlights that environmental changes associated with global warming and altered precipitation regimes have the potential to shift and expand the distribution of arbovirus vectors, including *Aedes* (dengue, chikungunya, and Zika) (GOACHE *et al.*, 2025). These effects are not restricted to average temperature increases: extremes of drought and heavy rainfall can alter water storage practices and the availability of urban/peri-urban breeding sites, elevating transmission risk in contexts with deficient infrastructure (IWAMURA *et al.*, 2020). Thus, studies on environmental determinants and urban risk reviews reinforce that mapping and predicting risk require joint analysis of climatic, environmental, and socioeconomic variables, especially in scenarios of rapid urbanization (KESETYANINGSIH *et al.*, 2018).

In terms of magnitude, global estimates of dengue distribution and burden indicate a large population at risk and significant spatial heterogeneity, with direct implications for surveillance and territorial prioritization of interventions. For leishmaniasis, evidence across different contexts points out that spatio-temporal patterns can be partially explained by meteo-climatic determinants, suggesting sensitivity of the vector–parasite–host system to environmental conditions. Although the literature varies regarding the relative weight of each variable (e.g., temperature vs. precipitation vs. socio-environmental factors), there is convergence that environmental changes and urbanization can create new ecological opportunities for vectors and increase the probability of emergence/reemergence, which supports integrated surveillance approaches (CAMPOS *et al.*, 2017).

In summary, the body of evidence suggests that more precise interventions depend on the integration of: (i) climate data (averages, seasonality, and extremes); (ii) vector ecology and behavior; and (iii) urban and connectivity determinants that modulate exposure and dispersion (KOLIMENAKIS *et al.*, 2021). This conclusion is consistent with reviews on modeling methods and risk mapping for dengue in urban settings, as well as analyses emphasizing the need for sustainable and locally adapted vector control strategies in the face of environmental changes and insecticide resistance (KLEEF *et al.*, 2011).

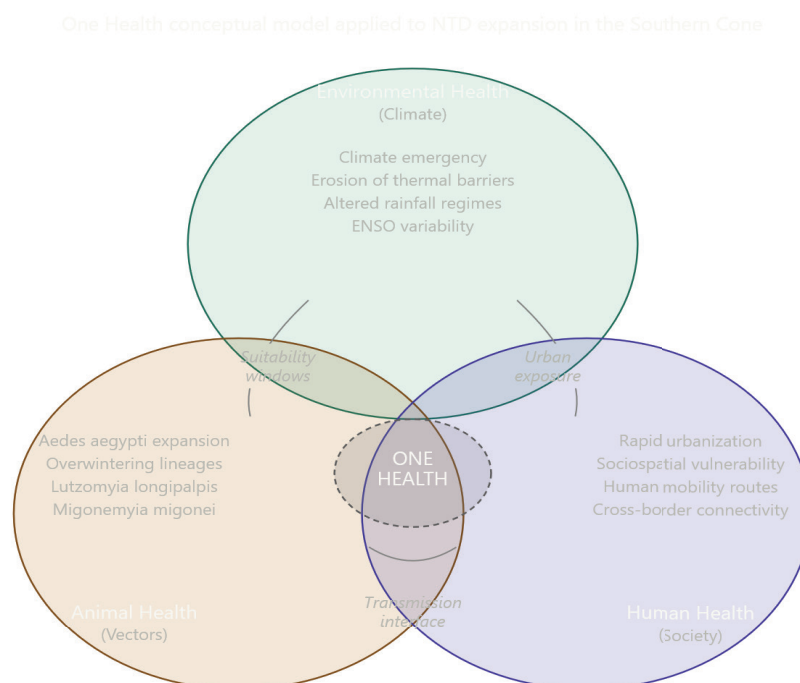


Figure 1 – Conceptual diagram of the one health approach applied to dengue and leishmaniasis expansion in the Southern Cone. Source: primary.

EPIDEMIOLOGICAL SCENARIO IN SOUTHERN BRAZIL

The Southern Region of Brazil (Paraná, Santa Catarina, and Rio Grande do Sul) historically lay near a climatic “edge” for sustained dengue transmission because lower seasonal temperatures constrain temperature suitability for *Aedes* activity and, consequently, outbreak occurrence (BORRE *et al.*, 2022). However, evidence from Brazil-wide analyses indicates that the dengue transmission zone has expanded in the 21st century as temperature suitability barriers have been progressively eroded, with South Brazil showing strong sensitivity to the number of months per year with suitable temperatures for *Aedes* mosquitoes (LETA *et al.*, 2018). Consistently, a dedicated spatiotemporal analysis of *Aedes aegypti* house indices (HI) in Southern Brazil (2003-2021) documented a marked increase in municipalities confirming vector presence and showed positive correlations between infestation indices and climate/environmental variables (e.g., precipitation, temperature, humidity, and urban infrastructure), supporting the interpretation that local environmental conditions can offset historically limiting winters and sustain increasing risk in the region (BRASIL, 2024).

In Paraná (PR), the interaction between climatic suitability, urbanization, and connectivity is particularly relevant because PR sits at the northern margin of the South Region, where warmer conditions increase seasonal suitability, and where network connectivity is a recognized driver of outbreak spread at the national scale (SIMON & RANGEL, 2021). At the regional (Southern Cone) scale, evidence from a temperate Argentinian province (Santa Fe) shows increasing dengue circulation since 2009 and a major outbreak in 2020, demonstrating that large epidemics can occur in temperate settings when climate and connectivity pressures align (SAMY & MORALES, 2017). More generally for Argentina, epidemic magnitude and local outbreak occurrence were associated with mild thermal conditions (notably in autumn, which may favor vector persistence and egg-bank dynamics) and with virus pressure from bordering endemic countries, reinforcing that border-adjacent areas are especially sensitive to bidirectional importation and seasonal temperature windows (*op. cit.*). These findings provide a more appropriate evidentiary basis for discussing PR border dynamics (e.g., the Triple Frontier context) than the previously misapplied yellow-fever study, because they explicitly connect border-connected importation and climatic seasonality to outbreak emergence in temperate and subtropical South America (LOURENÇO-DE-OLIVEIRA *et al.*, 2013). In addition, the covid-19 period is documented as a stressor that coincided with relevant changes in dengue reporting and dynamics in Brazil, supporting cautious discussion of surveillance pressure and concurrent epidemics during 2020-2021 without attributing PR-specific information to out-of-scope sources (LÓPEZ *et al.*, 2021).

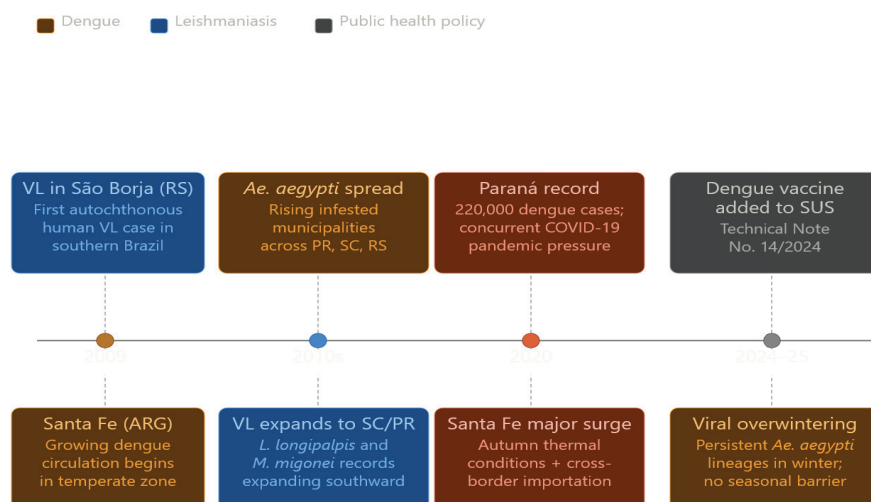


Figure 2 – Timeline of key epidemiological milestones, vector expansion records, and public health policy interventions in the Southern Cone (2009-2025). Source: primary.

In Santa Catarina State (SC), there is a gradual growth in dengue cases, initially concentrated in coastal and tourist regions, where the movement of people is not limited to Brazilian territory. This continuous flow, associated with port activity and indirect impacts from neighboring countries, imposes additional challenges on surveillance and emergency response to outbreaks (GOMES *et al.*, 2024).

In Santa Catarina (SC), the literature indicates that dengue risk should be framed through the combined lens of increasing climatic suitability, urbanization/infrastructure, and connectivity-mediated spread, because these factors jointly explain dengue expansion patterns across Brazil and the shifting southern barrier (WILSON *et al.*, 2020). Empirically, the HI-based study for Southern Brazil reported a substantial increase in municipalities with confirmed *Ae. aegypti* presence over time and highlighted climate/environmental correlates of infestation, which is directly relevant to SC's heterogeneous geography and the need for locally tailored surveillance where suitability varies across space and seasons (ROBERT *et al.*, 2020). Where manuscript claims involve specific tourism or port mechanisms, they should be supported by SC-specific surveillance bulletins or technical documents; absent such sources in the current reference set, the discussion should remain anchored to the supported determinants, namely climate suitability, urban infrastructure, and connectivity (ROTH *et al.*, 2014).

In Rio Grande do Sul (RS), the traditional notion of climatic protection has become increasingly fragile as dengue has expanded into temperate and subtropical zones and as suitability shifts southwards, increasing the vulnerability of immunologically naïve communities located at the edge of former barriers (BERMANN *et al.*, 2025). A preprint integrating entomological, epidemiological, and high-resolution genomic data for Southern Brazil (with emphasis on RS) reports substantial growth in dengue cases from 2020 onwards alongside partial-to-full *A. aegypti* municipal invasion, and it describes persistent overwintering lineages driving seasonal outbreaks – findings that, while preliminary due to preprint status, are consistent with the concept that winter is no longer an absolute barrier once the vector is established and seasonal suitability is sufficient (CARBAJO *et al.*, 2018). At the Southern Cone interface, the Argentine evidence that outbreaks are associated with autumn temperature conditions and cross-border case pressure supports interpreting RS border municipalities (e.g., corridors connecting Argentina and Uruguay) as plausible entry and amplification zones during favorable seasons, provided local surveillance corroborates such patterns (OLIVEIRA *et al.*, 2023).

For visceral leishmaniasis (VL), the epidemiological narrative must be supported by literature that actually addresses Southern Brazil and adjacent cross-border dynamics. A regional report from Santa Catarina documented canine VL in southern SC and explicitly contextualized the South as historically non-endemic until the late 2000s and early 2010s, referencing the 2009 VL outbreak in São Borja (RS), a border municipality, and subsequent detections that signal southward emergence and the relevance of international proximity (PETERSON *et al.*, 2017). Complementarily, a systematic review focusing on Southern Brazil compiled evidence on the distribution of *Migonomyia migonei* (a putative vector of *Leishmania infantum*) across PR, SC, and RS and concluded that its widespread presence in PR and limited but present records in SC/RS justify heightened attention to VL in humans and animals, alongside intensified surveillance and investigation of suspected autochthony (LÓPEZ *et al.*, 2021). Together, these sources justify a discussion of VL interiorization and border sensitivity in the South grounded in region-specific entomological and epidemiological evidence rather than out-of-scope studies (GÓMEZ-BRAVO *et al.*, 2017).

Finally, because this manuscript is a narrative review (secondary synthesis), any conceptual maps or diagrams representing dispersal routes or surveillance challenges in PR/SC/RS should be labeled as “Source: Prepared by the authors based on the literature review” (or equivalent), to avoid contradictions with the methodological scope and to clarify that figures are authorial syntheses rather than primary datasets (CARBAJO *et al.*, 2018). Where the manuscript asserts operational issues such as harmonization problems among SINAN, DATASUS, and state systems, these statements should be backed by appropriate Brazilian technical documents (e.g., Ministry of Health notes or state surveillance reports); in the current reference set, such a claim is not supported by the previously cited out-of-scope paper and should therefore be either removed or re-sourced with proper technical documentation (ROBERT *et al.*, 2020).

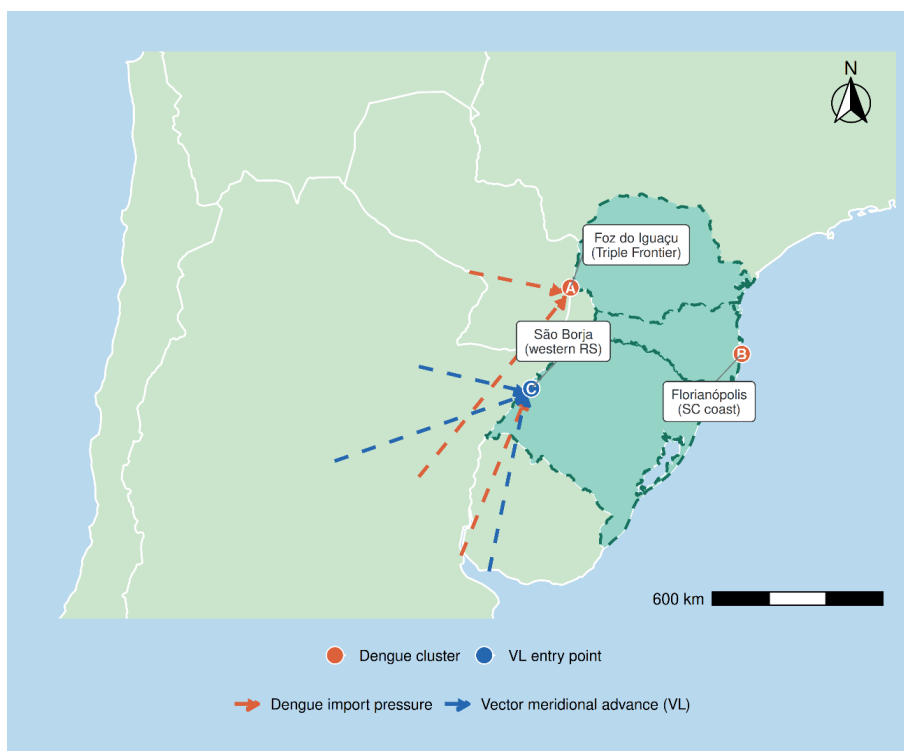


Figure 3 – Spatiotemporal distribution of NTD clusters and transboundary corridors in the Southern Cone. Selected landmarks: A) Foz do Iguaçu (Triple Frontier); B) coastal Santa Catarina; C) São Borja (western border). Arrows indicate regional connectivity pressure and vector advancement. Source: primary.

PUBLIC POLICIES AND COPING STRATEGIES

The response to the advancement and reemergence of vector-borne diseases under climate change scenarios requires integrated public policies that articulate environmental, epidemiological, and social actions. This necessity arises because the literature demonstrates that dengue transmission is modulated simultaneously by climatic variables and contextual determinants, such as urban conditions and social vulnerabilities, thereby limiting the effectiveness of isolated interventions (BERMANN *et al.*, 2025). In this sense, critical reviews of quantitative approaches to dengue indicate that more robust strategies depend on decision systems capable of integrating climatic, environmental, and epidemiological information, which reduces uncertainties and enhances anticipation and response capacities (LOURENÇO-DE-OLIVEIRA *et al.*, 2013). Additional evidence, even from other geographical contexts, reinforces that the emergence and expansion of dengue can occur when environmental and climatic changes alter suitability for vectors, supporting the need for adaptive and evidence-based policies in the face of ongoing climate change scenarios (OLIVEIRA *et al.*, 2023).

In the Brazilian context, technical-normative documents from the Ministry of Health must serve as the primary reference when discussing recent national decisions. Consequently, the inclusion of dengue vaccination within the Unified Health System (SUS), as described in Technical Note n. 14/2024 of the Ministry of Health, must be grounded directly in this official document, given that it constitutes the primary source of public policy for the country in 2024 (PETERSON *et al.*, 2017). Scientific studies on vaccines can be utilized complementarily to discuss specific technical-epidemiological aspects. For instance, evidence indicating that periods of high transmission defined by rainfall did not alter the efficacy of a dengue vaccine in endemic areas can be deployed solely to support the debate on vaccine strategy performance under seasonal variability, without replacing national normative documentation (ROTH *et al.*, 2014).

Regarding surveillance and the targeting of actions, this section avoids local statistics (such as municipal risk percentages in Santa Catarina) when they are not backed by explicitly cited state bulletins or technical reports. Adhering strictly to the available sources, it can be consistently argued

that surveillance tools and predictive models in urban environments benefit from integrating climatic and environmental variables to guide intervention priorities and resource allocation, as indicated in reviews of dengue risk-mapping methods and influential factors in urban settings (LÓPEZ *et al.*, 2021). Convergently, syntheses on climate and transmission also reinforce that utilizing climate evidence in surveillance can improve the capacity to anticipate periods of heightened risk, provided it is anchored in appropriate data and models with clearly recognized limitations (YIN *et al.*, 2022).

For leishmaniasis, the discussion of policies and strategies must recognize that, beyond vector control and surveillance, operational challenges regarding diagnosis and timely detection persist. Although not dealing with Brazilian policy, evidence that meteo-climatic determinants are associated with space-time patterns of visceral leishmaniasis in a traditionally non-endemic setting illustrates the relevance of incorporating environmental variables into surveillance systems and prevention strategies, particularly in contexts of environmental change (PASIN *et al.*, 2018). In parallel, new diagnostic approaches (such as CRISPR-Cas-based assays) have been proposed to enhance the molecular detection of *Leishmania*; however, when such evidence stems from preprints, it is essential to explicitly state their preliminary nature (not peer-reviewed) and avoid attributing incorrect bibliographic identifiers to them (NAISH *et al.*, 2014). Thus, within the scope of this narrative review, the most defensible recommendation based on the available set of sources is to strengthen public policies that integrate evidence-based surveillance (including climate signals), interventions recommended in national technical documents, and scalable diagnostic capacity, while maintaining strict traceability of sources and clearly distinguishing consolidated evidence from preliminary findings (MORIN *et al.*, 2013).

CONCLUSION

This narrative review synthesizes evidence indicating that the recent intensification of dengue and the consolidation and expansion of leishmaniasis risk in Southern Brazil result from a multifactorial process. In this process, (i) increased local climate suitability and seasonal variability; (ii) urban and infrastructural conditions supporting vector infestation; and (iii) human connectivity and mobility combine to reconfigure regional vulnerability. Specifically, spatiotemporal analyses for Southern Brazil document a significant increase in municipalities confirming *Aedes aegypti* presence, revealing a positive association between entomological indices and climatic/environmental variables—such as temperature, precipitation, humidity, and urban infrastructure. Meanwhile, evidence for 21st-century Brazil indicates that dengue expansion is jointly explained by climate suitability, urbanization, and connectivity. Recent findings (still preliminary due to their preprint status) are also consistent with the notion that once established, the vector can sustain seasonal transmission in temperate and subtropical areas, with outbreak growth associated with municipal invasion/infestation and viral persistence over time.

In the field of public health responses, this synthesis reinforces that isolated measures tend to be insufficient when facing coupled and spatially heterogeneous determinants. Thus, interventions such as strengthening vector control and evidence-based territorial prioritization remain central to reducing transmission and mitigating outbreaks, particularly when guided by climatic-environmental information and localized infestation indicators. However, the literature also suggests that the effectiveness and sustainability of these strategies depend on a continuous capacity for monitoring and adaptation, especially in scenarios of environmental change and the territorial expansion of risk.

Regarding surveillance and data governance, the literature utilized in this review does not support a definitive claim regarding specific harmonization failures between national and state systems for dengue and leishmaniasis in the South. Instead, the gathered evidence points toward a plausible operational gap: as risk expands spatially and becomes more sensitive to connectivity and seasonality, the need grows to integrate entomological, climatic, environmental, and epidemiological information into interoperable decision-making routines, including in areas with high population mobility. In this regard, the challenge to be addressed is not merely increasing data collection but elevating its capacity to guide timely and coordinated decisions across multiple management levels, aligned with the spatiotemporal dynamics of vectors and transmission.

Finally, this review concludes that the full adoption of a One Health approach – explicitly operationalized through the triad of climate change, vector expansion/establishment, urbanization/infrastructure and connectivity (human) – is fundamental to reducing the risks and inequalities associated with dengue and leishmaniasis in the subtropical context of Southern Brazil. Regional evidence on leishmaniasis in the South (including vector records, reviews on occurrence, and the emergence of foci) reinforces that sustainable responses require integrated human–animal–environment surveillance and detection/action capacities in historically non-endemic territories, where introduction and maintenance can occur under favorable environmental and social conditions. Therefore, long-term public policies must prioritize intersectoral, evidence-based strategies adapted to ongoing environmental changes, articulating prevention, surveillance, and response to enhance health system resilience against the expansion of these diseases.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest associated with this publication.

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