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https://doi.org/10.1590/0103-8478cr20260057

Submitted on: 2026-11-11
Posted on: 2026-11-11 (version 1)
(YYYY-MM-DD)

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Ciência Rural, Santa Maria, v.57:1, e20260057, 2027 http://doi.org/10.1590/0103-8478cr20260057

ISSNe 1678-4596
MICROBIOLOGY

A twelve-year epidemiological analysis of confirmed notifiable diseases in domestic livestock species in Espírito Santo, Brazil

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Uma análise epidemiológica de doze anos de doenças de notificação obrigatória confirmadas em espécies de animais de produção no Espírito Santo, Brasil

Received 02.05.26 Approved 08.24.26 Returned by the author xx.xx.xx
CR-2026-0057.R2
Editor: Rudi Weiblen

SciELO Preprints - This document is a preprint and its current status is available at: https://doi.org/10.1590/0103-8478cr20260057

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A twelve-year epidemiological analysis of confirmed notifiable diseases in domestic livestock species in Espírito Santo, Brazil

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ABSTRACT: This study analysed the epidemiology of notifiable diseases confirmed in domestic livestock species in Espírito Santo, Brazil, from 2012 to 2023, examining temporal and spatial patterns, frequency, and disease introduction. Data from the Institute of Agricultural and Forestry Defense of Espírito Santo (IDAF) included only officially confirmed cases of 48 diseases in cattle, horses, swine, poultry, bees, and sheep. Records were classified by disease, species, municipality, and year of confirmation. Spatial analyses were performed for rabies, equine infectious anemia (EIA), bovine tuberculosis, bovine brucellosis, glanders, and avian influenza, with maps by municipality. Statistical analyses used regression models and T-tests ($P < 0.05$) for temporal trend analysis. The diseases with the highest number of confirmed cases were enzootic pneumonia and circovirus in swine, EIA in horses, and tuberculosis and rabies in cattle. The following diseases were confirmed for the first time in the state: West Nile fever in horses, European foulbrood and small hive beetle in bees, and highly pathogenic avian influenza in poultry. The frequency of confirmed cases generally declined over the years, except for rabies, which occurred in 87.0% of municipalities. Glanders was confirmed in 16.6% of municipalities, EIA in 58.9%, while bovine tuberculosis and brucellosis were concentrated in the southern region, affecting 41.0% and 38.5% of municipalities, respectively. The findings reinforce the need for continuous surveillance, improved reporting, and targeted control strategies for notifiable diseases. In addition, this study contributed to understanding veterinary surveillance in livestock production systems worldwide.
Key words: surveillance, rabies, brucellosis, tuberculosis, Espírito Santo.

Uma análise epidemiológica de doze anos de doenças de notificação obrigatória confirmadas em espécies de animais de produção no Espírito Santo, Brasil

RESUMO: Este estudo analisou a epidemiologia de doenças confirmadas em animais de produção no Espírito Santo, Brasil, entre 2012 e 2023, com o objetivo de avaliar os padrões temporais e espaciais, a frequência e o surgimento de novas enfermidades. Para isso, os dados do Instituto de Defesa Agropecuária e Florestal do Espírito Santo (IDAF) incluíram somente casos oficialmente confirmados de 48 doenças em bovinos, equídeos, suínos, aves, abelhas e ovinos. Além disso, os registros foram classificados por doença, espécie, município e ano da confirmação. As análises espaciais foram realizadas para raiva, anemia infecciosa equina (AIE), tuberculose bovina, brucelose bovina, mormo e influenza aviária, com elaboração de mapas por município. Enquanto isso, as análises estatísticas utilizaram modelos de regressão e teste T ($P < 0.05$) para análise de tendência temporal. Os resultados mostram que as doenças com maior número de casos confirmados foram pneumonia enzoótica e circovirose em suínos, AIE em equídeos e tuberculose e raiva em bovinos. Por outro lado, também foram confirmadas pela primeira vez no estado: febre do Nilo Ocidental em equídeos, loque europeia e pequeno besouro das colmeias em abelhas, e influenza aviária de alta patogenicidade em aves. A frequência de casos confirmados diminuiu ao longo dos anos, exceto para a raiva, presente em 87,0% dos municípios. O mormo ocorreu em 16,6% dos municípios, a AIE em 58,9%, enquanto tuberculose e brucelose bovinas concentraram-se na região sul, afetando 41,0% e 38,5% dos municípios, respectivamente. Portanto, os achados reforçam a necessidade de vigilância contínua, aprimoramento das notificações e estratégias direcionadas de controle para doenças de notificação obrigatória. Adicionalmente, o estudo também contribui para a compreensão dos sistemas de vigilância veterinária em sistemas de produção animal em âmbito mundial.
Palavras-chave: vigilância, raiva, brucelose, tuberculose, Espírito Santo.

INTRODUCTION

Livestock production is directly linked to food security, public health, and economic sustainability. However, livestock systems face persistent health challenges caused by diverse pathogens, which can lead to substantial productivity losses worldwide and threaten food security (WORLD ECONOMIC FORUM, 2018; MAPA, 2022; JONES et al., 2019). Some of these diseases are zoonotic; and

Received 02.05.26 Approved 08.24.26 Returned by the author xx.xx.xx
CR-2026-0057.R2
Editor: Rudi Weiblen

SciELO Preprints - This document is a preprint and its current status is available at: https://doi.org/10.1590/0103-8478cr20260057

therefore, present additional risks to human health (ZANELLA, 2016). Notifiable diseases, formally listed by governmental authorities due to their economic and sanitary relevance (WOAH, 2013; WOAH, 2017), require compulsory reporting when suspected or confirmed. In Brazil, these diseases are officially listed by the Ministry of Agriculture and Livestock (MAPA) under Normative Instruction No. 50/2013 (BRASIL, 2013a). Evaluating their epidemiological patterns is essential for understanding their distribution, behaviour, and associated risk factors, supporting evidence-based prevention, control measures, and public health decision-making (SALMAN et al., 2003; CACERES et al., 2020).

In Espírito Santo (ES), previous epidemiological studies have focused on specific diseases, including rabies in herbivores (VIEIRA, 2013), bovine brucellosis (AZEVEDO, 2009), bovine tuberculosis (CALEGARI et al., 2020), leptospirosis (FAVERO et al., 2001; VIANA et al., 2010; BARONI et al., 2020), infectious bovine rhinotracheitis (IBR), bovine viral diarrhoea (BVD) (ALMEIDA et al., 2021), and fasciolosis in cattle, sheep, goats, and buffalo (ALVES et al., 2011; CARNEIRO et al., 2013; FREITAS et al., 2014). These studies contributed to important insights into prevalence and risk factors but were limited to individual diseases or specific animal groups. Despite the scientific contributions of earlier studies in ES, no previous research has assessed all notifiable diseases in domestic livestock species using official governmental records over an extended period. Furthermore, comprehensive long-term epidemiological studies integrating multiple notifiable diseases across domestic livestock species at a statewide level remain limited, particularly those based on official surveillance data.

By combining temporal and spatial analyses, such approaches contributed not only to regional disease control strategies, but also to a broader understanding of veterinary surveillance systems and disease dynamics in similar livestock production contexts worldwide. To address this gap, the present study conducted a statewide epidemiological analysis of officially confirmed notifiable diseases recorded by the Institute of Agricultural and Forestry Defense of Espírito Santo (IDAF) from 2012 to 2023, providing an integrated perspective to support animal health management and public health planning.

MATERIALS AND METHODS

The study included all 78 municipalities of Espírito Santo (ES), southeastern Brazil. Data were obtained from the state animal health surveillance system (IDAF), including confirmed cases of notifiable diseases in domestic livestock species from 2012 to 2023, following Normative Instruction No. 50/2013 (BRASIL, 2013a). The dataset comprised only confirmed cases recorded by the official veterinary service, excluding initial notifications that may have involved suspected cases. Notifications from 2012 to 2019 were recorded via Epidemiological Report Forms (FEPI) and SivCont, and since 2020 via Brazilian Veterinary Surveillance and Emergency System (e-SISBRAVET), detailing year, municipality, species, and number of confirmed cases. The official database did not differentiate cases detected through passive notifications from those identified through active surveillance activities, and all confirmed cases were included in the analyses.

From 2014 onwards, some diseases classified under Item 4 of MAPA Normative Instruction No. 50/2013, including bovine anaplasmosis, babesiosis, blackleg, foot rot, myiasis, and ovine scabies, were recorded qualitatively as present or absent. According to the reporting procedures established in the National Animal Health Information System (SIZ) Manual and the corresponding FEPI reporting instructions, monthly reports for these diseases required only the indication of the presence or absence of confirmed cases, rather than quantitative reporting (BRASIL, 2013a; 2013b). Data were organized by disease, species, municipality, month, year, and confirmed cases. Poultry notifications were by outbreak (except HPAI for wild species, recorded individually), bees by hives, and other animals individually.

Spatial distribution of rabies, equine infectious anemia, bovine tuberculosis, bovine brucellosis, glanders, and HPAI was mapped using QGIS 3.28.1 and IBGE geographic data, displaying cumulative confirmed cases with municipality-level colour scales (ZEYNALOVA et al., 2015; WANG et al., 2021). ES macro-regions (GEOBASES, 2017) were used for descriptive analysis.

Temporal trends of rabies, EIA, bovine tuberculosis, bovine brucellosis, and glanders were evaluated using graphical dispersion analyses with regression trend lines. Confirmed cases were considered the dependent variable, and year was considered the independent variable. Linear and polynomial regression models of different degrees were tested using GENES software. Model significance was assessed using the T-test ($P < 0.05$), and the coefficient of determination (R^2) was used to evaluate the proportion of variation in confirmed cases explained by time. The model presenting the highest statistically

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significant R^2 was selected as the best-fitting trend line for each disease. The regression analyses were used as an exploratory approach to describe temporal patterns and visualize disease trends throughout the study period. Because the analyzed variables were annual count data, potential overdispersion and zero inflation were acknowledged, particularly for diseases with low or intermittent occurrence. However, given the exploratory purpose of the temporal analyses, the short time series, and the heterogeneity among diseases and reporting structures, generalized count-data models were not fitted. Therefore, regression trend lines were interpreted only as descriptive tools to visualize temporal patterns, rather than as predictive or causal epidemiological models.

RESULTS AND DISCUSSION

From 2012 to 2023, 48 notifiable diseases were confirmed in domestic livestock species in Espírito Santo (ES) according to MAPA's Normative Instruction No. 50/2013 (BRASIL, 2013a), including 21 in bovines, nine in equines, seven in swine, 10 in poultry, two in bees, and one in sheep (Table 1, Table 2 and Table 3). The diseases with the highest numbers of confirmed cases were enzootic pneumonia (n = 1960) and circoviral disease (n = 1032) in swine, equine infectious anemia (EIA, n = 913), rabies (n = 531), and bovine tuberculosis (n = 454). Four diseases were first recorded in the state: West Nile fever and European foulbrood in 2019, small hive beetle in 2022, and highly pathogenic avian influenza (HPAI) in 2023.

Several common veterinary diseases, including bovine anaplasmosis, babesiosis, BVD, IBR, leptospirosis, and enzootic leukosis, had low or intermittent reporting, which may reflect underreporting associated with diagnostic limitations, lack of veterinarian awareness, and economic concerns (DO MONTE, 2021; DE ARAÚJO et al., 2020). From 2014 onwards, some of these diseases were recorded qualitatively as present (P), following the reporting procedures described in the National Animal Health Information System (SIZ) Manual (BRASIL, 2013b) for diseases classified under Item 4 of MAPA Normative Instruction No. 50/2013 (BRASIL, 2013a).

Table 1 - Number of confirmed cases of notifiable diseases under immediate notification in ovines, bovines and equines recorded by IDAF in Espírito Santo, Brazil, from 2012 to 2023.

DISEASE	SPECIES	----------Number of confirmed cases per year----------												
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	TOTAL
RABIES	OVINE	2	0	0	1	0	0	1	0	2	0	0	1	7
ACTINOMYCOSIS	BOVINE	4	0	0	0	0	0	0	0	0	0	0	0	4
BRUCELLOSIS	BOVINE	28	85	33	3	3	12	1	8	7	13	0	2	195
COCCIDIOSIS	BOVINE	2	0	0	0	0	0	0	0	0	0	0	0	2
FILARIASIS	BOVINE	2	0	0	0	0	0	0	0	0	0	0	0	2
HYDATIDOSIS	BOVINE	0	0	0	0	4	0	0	0	0	0	0	0	4
IBR	BOVINE	6	0	1	0	0	0	0	0	0	0	0	0	7
LEPTOSPIROSIS	BOVINE	6	2	0	0	0	0	0	0	0	0	0	0	8
ENZOOTIC LEUKOSIS	BOVINE	0	1	0	0	0	0	0	0	0	0	0	0	1
RABIES	BOVINE	78	48	67	48	26	25	19	46	25	38	49	62	531
SALMONELLOSIS	BOVINE	0	16	0	0	0	0	0	0	0	0	0	0	16
HEMORRHAGIC SEPTICAEMIA	BOVINE	1	0	0	0	0	0	0	0	0	0	0	0	1
TRYPANOSOMIASIS	BOVINE	0	34	60	8	0	0	0	0	0	0	0	0	102
TUBERCULOSIS	BOVINE	74	88	33	64	67	24	33	19	8	37	3	4	454
POX	BOVINE	27	0	0	0	2	0	0	0	0	2	0	0	31
STRANGLES (EQUINE ADENITIS)	EQUINE	23	0	4	0	0	0	0	0	0	0	0	0	27
EIA	EQUINE	341	143	47	95	55	42	28	37	36	39	32	18	913
WEST NILE FEVER	EQUINE	0	0	0	0	0	0	0	3	0	0	0	0	3
EQUINE INFLUENZA	EQUINE	226	0	0	0	0	0	0	0	0	0	0	0	226
LEPTOSPIROSIS	EQUINE	0	0	1	0	0	0	0	0	0	0	0	0	1
GLANDERS	EQUINE	0	32	4	25	0	2	0	0	1	4	1	0	69
NUTTALLIOSIS	EQUINE	1	0	0	0	0	0	0	0	0	0	0	0	1
RABIES	EQUINE	13	5	13	11	7	10	7	16	3	6	7	17	115
TETANUS	EQUINE	1	0	3	2	0	0	0	0	0	0	1	0	7

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Table 2 - Number of confirmed cases/outbreaks/hives of notifiable diseases under immediate notification in poultry, bees and swine recorded by IDAF in Espírito Santo, Brazil, from 2012 to 2023.

DISEASE	SPECIES	----------Number of confirmed cases/outbreaks/hives per year----------												
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	TOTAL
BOTULISM (OUTBREAKS)	POULTRY	0	0	1	0	1	0	0	0	0	0	0	0	2
AVIAN POX (OUTBREAKS)	POULTRY	0	0	1	0	0	0	0	0	0	0	0	0	1
AVIAN COCCIDIOSIS (OUTBREAKS)	POULTRY	0	0	0	0	1	0	0	0	0	0	0	0	1
AVIAN CHOLERA (OUTBREAKS)	POULTRY	0	0	1	0	0	0	0	0	0	0	0	0	1
COLIBACILLOSIS (OUTBREAKS)	POULTRY	0	0	1	0	0	0	0	0	0	1	0	0	2
AVIAN CORYZA (OUTBREAKS)	POULTRY	0	0	0	0	3	0	0	0	0	0	0	0	3
HPAI	POULTRY (Subsistence) (OUTBREAKS)	0	0	0	0	0	0	0	0	0	0	0	8	8
	WILD BIRDS (INDIVIDUAL CASES)	0	0	0	0	0	0	0	0	0	0	0	337	337
LARYNGOTRACHEITIS (OUTBREAKS)	POULTRY	0	0	0	0	0	0	0	0	0	0	0	1	1
MYCOPLASMOSIS (OUTBREAKS)	POULTRY	0	0	0	1	3	0	1	3	0	0	0	0	8
AVIAN SALMONELLOSIS (OUTBREAKS)	POULTRY	0	0	0	0	0	0	1	0	0	0	1	0	2
EUROPEAN FOULBROOD (HIVE)	BEES	0	0	0	0	0	0	0	5	0	0	0	0	5
SMALL HIVE BEETLE (HIVE)	BEES	0	0	0	0	0	0	0	0	0	0	20	12	32
CIRCOVIRUS	SWINE	169	47	243	292	281	0	0	0	0	0	0	0	1032
PORCINE CYSTICERCOSIS	SWINE	0	0	0	0	0	1	0	0	0	0	0	0	1
HYDATIDOSIS	SWINE	0	0	0	0	0	4	0	0	0	0	0	0	4
STREPTOCOCCAL MENINGITIS	SWINE	0	85	0	0	0	0	0	0	0	0	0	0	85
ENZOOTIC PNEUMONIA	SWINE	899	111	324	353	273	0	0	0	0	0	0	0	1960

Outbreaks and hive-level records were used for poultry and bee diseases because these animals are typically maintained in large groups within a single environment, making individual animal counting not always feasible or consistently available in the official surveillance records. Therefore, disease occurrence was represented by outbreaks or affected hives when individual case counts were not applicable.

Temporal analysis (Figure 1) of major notifiable diseases showed peaks in 2012-2013 for rabies, EIA, bovine tuberculosis, brucellosis, and glanders, followed by general declines. Regression analyses showed that most evaluated diseases presented coefficients of determination (R^2) above 0.5, suggesting that the temporal trend lines described more than half of the variation in confirmed cases for these diseases. For glanders, none of the tested equations showed statistical significance ($P > 0.05$); however, the fourth-degree polynomial model presented the highest R^2 value ($R^2 = 0.49$). Rabies showed the best fit with a second-degree polynomial trend line ($R^2 = 0.62$), suggesting an initial decline followed by subsequent increases in confirmed cases over time. Equine infectious anemia and bovine brucellosis were best represented by third-degree ($R^2 = 0.89$) and sixth-degree ($R^2 = 0.91$) polynomial models, respectively. EIA demonstrated a declining temporal trend, whereas bovine brucellosis showed fluctuations between 2016 and 2022 despite an overall reduction tendency. Bovine tuberculosis was best fitted by a linear regression model ($R^2 = 0.70$), also indicating a decreasing temporal trend throughout the study period.

However, these trends should be interpreted with caution, as part of the observed reduction may reflect changes in surveillance and reporting practices rather than true epidemiological declines. Several operational changes occurred during this period, including the discontinuation of mandatory monthly

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Table 3 - Annual qualitative occurrence records of notifiable diseases under monthly surveillance in domestic livestock species, recorded by IDAF in Espírito Santo, Brazil, from 2012 to 2023.

DISEASE	SPECIES	----------Number of confirmed cases per year----------											
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
ANAPLASMOSIS	BOVINE	76	18	P	P	P	P	P	0	0	0	0	0
BABESIOSIS	BOVINE	88	12	P	P	P	P	P	0	0	0	0	0
BOTULISM	BOVINE	1	1	0	0	0	0	P	0	0	0	0	0
BVD	BOVINE	0	7	0	0	0	0	P	0	0	0	0	0
BLACKLEG	BOVINE	8	0	P	P	P	0	0	0	0	0	0	0
FOOT ROT	BOVINE	23	16	0	P	P	0	0	0	0	0	0	0
CASEOUS LYMPHADENITIS	BOVINE	5	0	3	0	P	0	0	0	0	0	0	0
PORCINE PARVOVIRUS	SWINE	0	0	0	0	P	0	0	0	0	0	0	0
ATROPHIC RHINITIS	SWINE	0	0	36	1	P	0	0	0	0	0	0	0

"P" indicates that the occurrence of the disease was officially confirmed during the respective year, although no quantitative case data were available. From 2014 onwards, these diseases were recorded qualitatively in the official animal health surveillance system, following the procedures established in the National Animal Health Information System (SIZ) Manual. They are classified under Item 4 of MAPA Normative Instruction No. 50/2013, which comprises diseases subject to monthly notification.

FEPI submission by accredited private veterinarians, changes in surveillance routines associated with the COVID-19 pandemic (CLARK et al., 2024), and the transition from FEPI/SivCont to e-SISBRAVET from 2020 onwards. These concurrent changes may have influenced reporting patterns independently of the actual occurrence of disease. Therefore, the apparent reduction in confirmed cases should not be interpreted as evidence of lower reporting performance of e-SISBRAVET itself, but rather as the result of multiple changes affecting the surveillance system during the study period. Although e-SISBRAVET provides a more integrated surveillance platform, comparisons between the pre- and post-2020 periods should be interpreted cautiously because the reporting systems and operational procedures were not directly comparable. A formal segmented pre-2020 versus post-2020 analysis was not performed because the limited number of annual observations, short post-transition period, and heterogeneity among diseases, reporting units, and notification categories would limit its robustness and could lead to overinterpretation. Thus, temporal trends were interpreted cautiously as descriptive indicators of reporting patterns in the official surveillance database.

Rabies exhibited a cyclical pattern, consistent with viral dynamics in bat colonies (JOHNSON et al., 2014; MARCOLONGO-PEREIRA et al., 2011). For spatial analyses (Figure 2), rabies was the most widespread disease, confirmed in 87% of municipalities. EIA predominated in municipalities with larger equine populations and favourable environmental conditions, particularly in Linhares, where river access and coffee plantations likely facilitated vector persistence (BARROS & FOIL, 2007; BUSTILLO, 2008). The peaks of glanders observed in 2013 and 2015 temporally coincided with official reports describing the introduction of infected Military Police horses into Espírito Santo (IDAF, 2013; IDAF, 2015). However, the present dataset did not include traceability or animal movement data allowing direct epidemiological linkage between these reported events and the confirmed cases analysed in this study.

Bovine tuberculosis and brucellosis were concentrated in southern (66.5%) and northern (23%) regions, which host 72% of the state's cattle (IBGE, 2023), and 59% of municipalities confirmed both diseases, reflecting their concurrent occurrence (LEE et al., 2023). Post-2015 declines in brucellosis may be associated with increased vaccination coverage (80% in 2015), though coverage dropped to 41.7% by 2022, indicating a potential risk for resurgence (MAPA, 2022; BRASIL, 2022a).

Emerging diseases highlight the dynamic nature of ES animal health. West Nile fever reached ES by 2018, affecting equines and posing public health risks (PAUVOLID-CORRÊA et al., 2011; MARTINS et al., 2019) and European foulbrood and *Aethina tumida* infestations may be associated with environmental stress and hive management (MORSE & FLOTTUM, 1997; HOOD, 2004; BRASIL, 2023). HPAI was first confirmed in 2023, mainly in coastal wild birds, with minor subsistence bird involvement,

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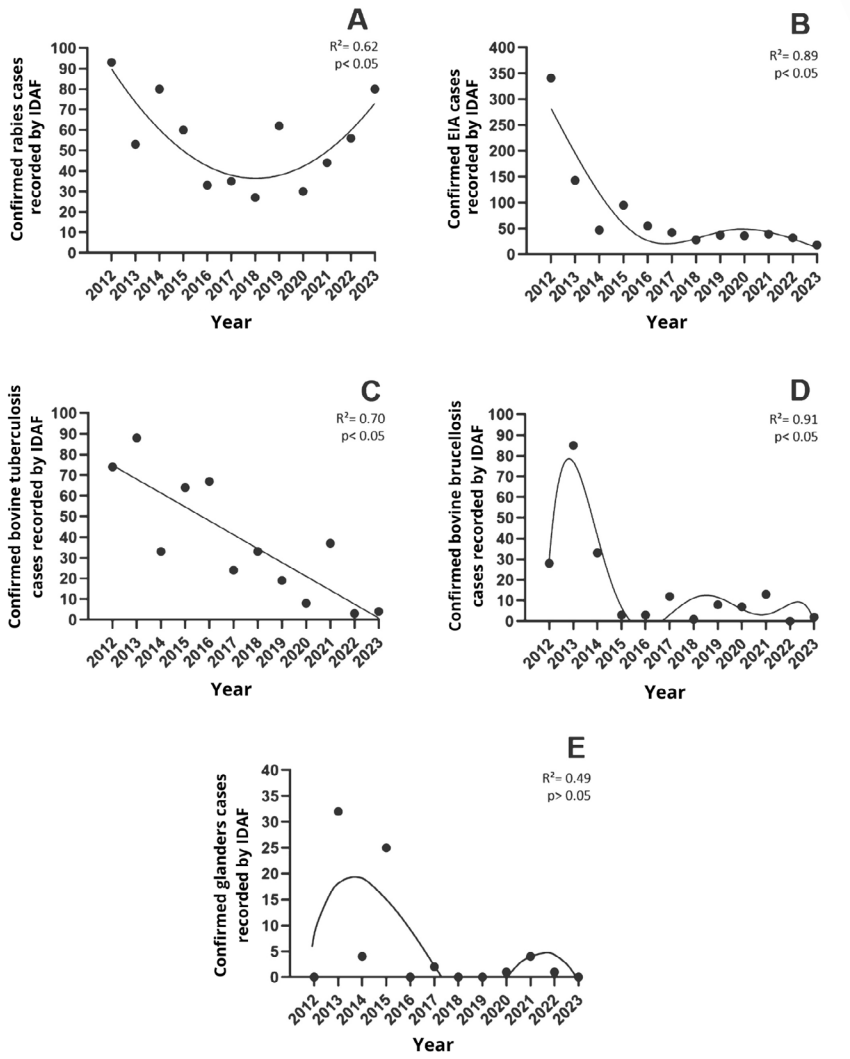


Figure 1 - Graphical dispersion and exploratory regression trend analyses of confirmed cases of rabies in domestic livestock species (A), EIA (B), bovine tuberculosis (C), bovine brucellosis (D), and glanders (E) reported to IDAF in the state of Espírito Santo from 2012 to 2023.

emphasizing the role of migratory birds in virus dissemination and the need for biosecurity. Direct exposure to infected wild birds is the main risk factor for the transmission of avian influenza to domestic birds, whether for commercial or subsistence farming (SWAYNE, 2008; BRASIL, 2022b; DE OLIVEIRA et al., 2024; FERREIRA et al., 2024).

The effectiveness of animal health surveillance systems depends not only on accurate diagnosis, but also on timely notification and rapid response by the official veterinary service. Although the present study did not directly evaluate notification intervals or response times, delays in disease reporting may contribute to underdetection, persistence of transmission, and reduced effectiveness of control measures. In addition, the official database did not distinguish cases identified through active surveillance activities from those detected through passive notifications, which may also influence temporal variations in disease frequency and case detection.

Factors such as limited awareness among producers, difficulties in accessing veterinary assistance, economic concerns, and variations in surveillance intensity may affect the notification process. Furthermore, the transition from previous reporting systems to e-SISBRAVET may have influenced notification dynamics and surveillance sensitivity over time. Although Espírito Santo has an

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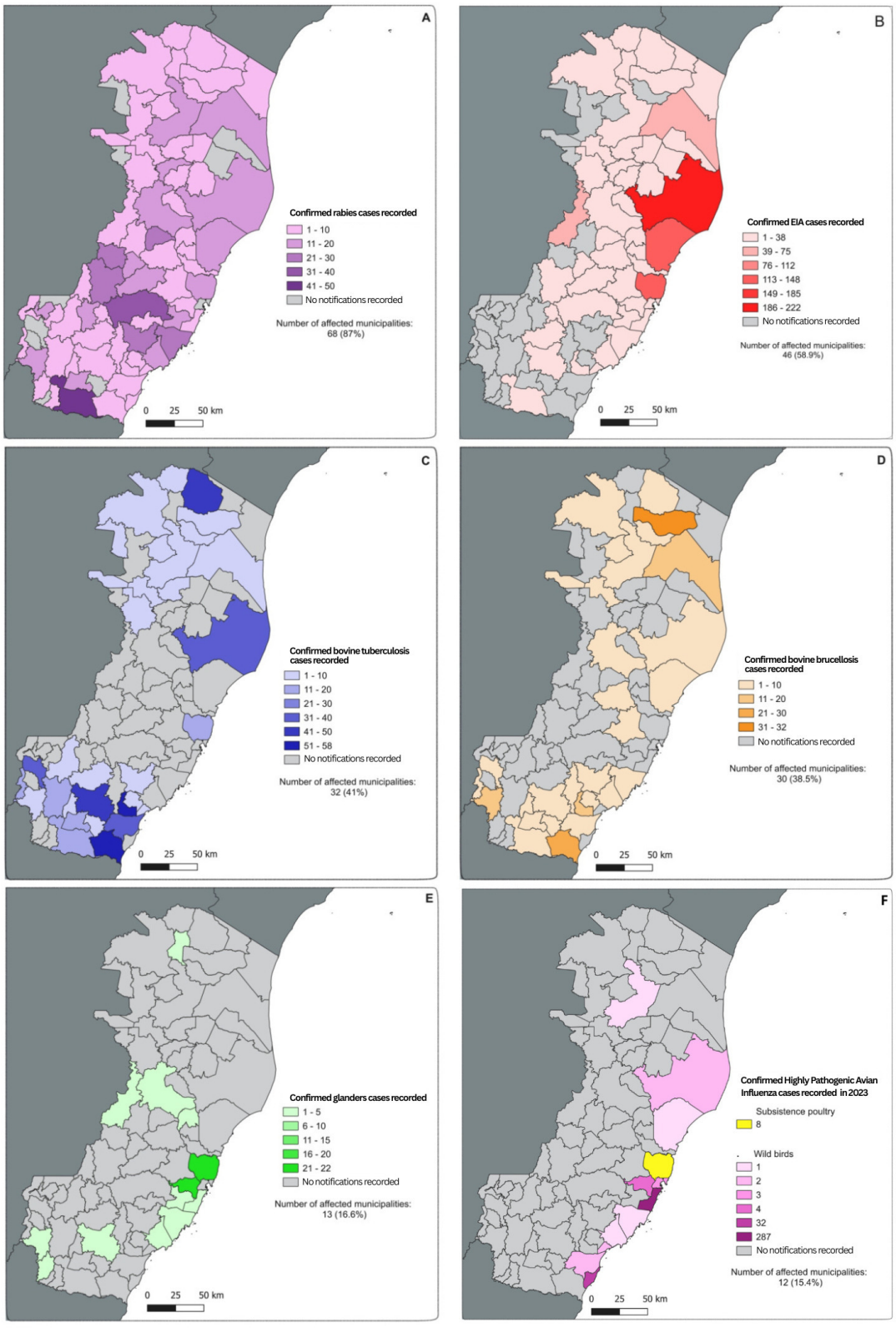


Figure 2 - Distribution of confirmed cases of rabies in domestic livestock species (A), EIA (B), bovine tuberculosis (C), bovine brucellosis (D), glanders (E) and Highly Pathogenic Avian Influenza in wild birds and subsistence animals (F) reported to IDAF by municipality in the state of Espírito Santo from 2012 to 2023.

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established official veterinary surveillance system, the present findings indicate opportunities to strengthen both awareness of mandatory disease notification and the responsiveness of sanitary authorities. Expanding educational actions directed toward producers and veterinarians, improving accessibility to reporting channels, and strengthening communication between field professionals and the official veterinary service may facilitate earlier detection and more efficient sanitary interventions. In addition, continued modernization and integration of digital notification systems may improve reporting efficiency and epidemiological monitoring in the state.

Overall, these findings demonstrate the importance of continuous and accurate disease reporting and surveillance to monitor endemic and emerging diseases, guide preventive measures, and support animal and public health. Furthermore, this study provides one of the few comprehensive long-term statewide assessments of officially reported notifiable diseases affecting multiple domestic livestock species in Brazil, integrating temporal and spatial analyses to identify epidemiological patterns, emerging threats, and surveillance challenges relevant not only to Espírito Santo, but also to veterinary public health systems in similar livestock production settings worldwide.

CONCLUSION

During the study period, multiple notifiable diseases were confirmed in Espírito Santo, including newly recorded diseases such as West Nile fever, European foulbrood, small hive beetle infestation, and HPAI. Rabies showed widespread distribution and a cyclical temporal pattern, while glanders peaks temporally coincided with official reports involving infected Military Police horses. EIA was concentrated in areas with large equine populations and favourable environmental conditions, and bovine brucellosis and tuberculosis were more frequent in regions with high cattle density. The post-2015 decline in brucellosis cases may be associated with increased vaccination coverage, although subsequent lower coverage may represent a potential risk for disease resurgence. HPAI confirmed cases in coastal areas highlight the role of migratory birds and the need for biosecurity in poultry farms. These findings reinforce the importance of continuous surveillance, accurate reporting, and targeted preventive measures to support animal and public health.

Furthermore, this study provides a comprehensive long-term statewide assessment of officially recorded notifiable diseases affecting multiple domestic livestock species, contributing to a broader understanding of veterinary surveillance systems and disease dynamics in similar livestock production settings worldwide. The present study has limitations inherent to secondary surveillance databases, including potential underreporting, differences in surveillance sensitivity over time, lack of distinction between active and passive surveillance, and absence of traceability data for epidemiological linkage.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study were obtained from the official records of the Instituto de Defesa Agropecuária e Florestal do Espírito Santo (IDAF), which are not publicly available due to institutional restrictions. Data may be made available upon reasonable request from the corresponding author, with prior authorization from IDAF.

ACKNOWLEDGMENTS

The authors thank Fundação de Amparo à Pesquisa e Inovação do Espírito Santo (FAPES) for funding through the Programa de Apoio aos Programas de Pós-Graduação Capixabas Emergentes (PROAPEM), call no. 04/2022; IDAF for partnership and data provision; and Professor Leonardo Oliveira Trivilin for assistance with statistical analysis. This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Brasil - Finance Code 001.

DECLARATION OF CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHORS' CONTRIBUTIONS

GPP contributed to conceptualization, data curation, research, methodology, writing of the original manuscript, and writing - review and editing. LCZ contributed to conceptualization, data curation, and methodology. DMD contributed to conceptualization, methodology, data and experimental validation, and writing - review and editing. JOC contributed to conceptualization, methodology, supervision, data and experimental validation, writing of the original manuscript, and writing - review and editing.

DECLARATION OF USE OF ARTIFICIAL INTELLIGENCE

Artificial intelligence tools were used to improve the manuscript's structure.

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