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Supporting Information

Supplementary material

This appendix was part of the submitted manuscript and has been peer reviewed. It is posted as supplied by the authors.

Appendix to: Dowsett C, Frentiu F, Devine GJ, Wenbiao H. Japanese encephalitis transmission in Australia: challenges and future perspectives. *Med J Aust* 2025; doi: 10.5694/mja2.52550.

Table 1: Empirical Japanese encephalitis virus (JEV) research in Australia following the 2021–2023 JEV outbreak

Author, date	Aim/Objective	Area	Climate variables included	Findings	Recommendations/Proposed actions
Flores Lima et al, 2024(1)	To develop a GIS-AHP model designed to identify potential JEV risk zones in Victoria, especially considering the implications of climate change.	Victoria, Australia	Temperature (min, max), precipitation; proximity to wetland	Climate was the most significant determinant, with a weight of 40%. Looking into the criteria nested within the climate category: (i) precipitation emerged as the most important criterion influencing JEV risk emergence in Victoria, accounting for 60% (0.60) of the total weight; (ii) minimum temperature followed at 23% (0.23); (iii) maximum temperature was given a weight of 17% (0.17).	This project primarily focused on delineating climate prerequisites conducive to vector and virus transmission. This emphasises the necessity to incorporate climate change and climate change projections to ascertain the climate suitability for the emergence of diseases, thereby fostering a more robust and predictive approach to managing and mitigating the risks associated with infectious diseases.
Furlong et al, 2022(2)	To estimate the geographic distribution of mosquito species known to be competent JEV vectors in the country by combining known mosquito occurrences and ecological drivers of distribution to reveal insights into communities at highest risk of infectious disease transmission.	Australia	Temperature, precipitation and evaporation, evapotranspiration, aridity index, atmospheric water deficit	Previous research has established that *Culex* populations thrive in the presence of widespread, flooded habitats caused by above average rainfall, highlighting the connection between higher than average La Nina rainfall in Australia in 2022 and subsequent rise in JEV cases. Jackknife analysis revealed aridity and water deficit, specifically the mean annual aridity index and annual atmospheric water deficit, ranked among the most important variables for the creation of all three species models. Variables containing information regarding evaporation and temperature were also identified as holding important information critical for species distribution model development.	Future research should also aim to understand how rates of climate and land use changes, species adaptation and resilience will influence pathogen, vector and host geographic distribution and burden of disease.
Walsh et al, 2023(3)	This study explored the extent to which wildlife-host habitat suitability, land cover and wetland composition and configuration, hydrological	Australia	Precipitation, temperature, wetlands, land cover data, rivers and waterways (surface water), isothermality, soil moisture	While preliminary, these findings highlight the importance of water presence in, and movement through, landscapes comprising ardeid habitat and ecotones with cultivated land.	This suggests the importance of incorporating wild waterbird surveillance into ongoing monitoring systems that are currently surveying mosquitoes and piggeries in affected areas, as well as expanding surveillance to include locations that are embedded within key

	geomorphology, and climate anomalies associated with the 2021 La Niña were associated with piggery outbreaks of JEV.				anthropogenic ecotones and exhibit a propensity to flooding.
Yakob et al, 2023(4)	The well-characterized JEV vector, *Culex annulirostris*, can disperse a considerable distance (4.4 km); Our aim was to identify the human population within this distance of a piggery and therefore potentially at risk of infection.	Australia	Discussion on drivers of transmission (not modelled): warming climate, flooding events, La Nina weather system, wetlands	This initial analysis demonstrates that approximately 3% of the human population in Australia may be vulnerable to JEV infection following its recent range expansion, if piggeries are a major source of virus.	In the future, protection from JEV in Australia may require: (i) intensive surveillance of piggeries; (ii) targeted vaccination of humans; (iii) an understanding of virus movement from northern Australia and Asia; (iv) studies on the vectorial capacity of mosquitoes for invading JEV genotypes; and (v) characterisation of the epidemiological role of wading birds and feral pigs.

References

1 Flores Lima M, Cotton J, Marais M, Faggian R. Modelling the risk of Japanese encephalitis virus in Victoria, Australia, using an expert-systems approach. *BMC Infect Dis* 2024; 24: 60.
2 Furlong M, Adamu A, Hickson RI, et al. Estimating the distribution of Japanese encephalitis vectors in Australia using ecological niche modelling. *Trop Med Infect Dis* 2022; 7: 393.
3 Walsh MG, Webb C, Brookes V. An evaluation of the landscape structure and La Niña climatic anomalies associated with Japanese encephalitis virus outbreaks reported in Australian piggeries in 2022. *One Health* 2023; 16: 100566.
4 Yakob L, Hu W, Frentiu FD, et al. Japanese encephalitis emergence in Australia: the potential population at risk. *Clin Infect Dis* 2022; 76: 335-337.