Increasing arbovirus risk in Chile and neighboring countries in the Southern Cone of South America

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On April 26, 2023, Chile declared a public health emergency in its northern and central regions in response to the presence of *Aedes aegypti* and the epidemiological situation of neighboring countries.[1] *Aedes aegpyti* is a highly efficient vector of dengue, chikungunya, Zika, and other arboviruses. The mosquito recently expanded within Parinacota (northern continental Chile) and was detected in Los Andes, Valparaíso Region (32°50′S, 70°32′W, elevation ~800 m), a location with no previous history of the vector. The emergency declaration also noted the proliferation of *Anopheles pseudopuntipenis*, a malaria vector, in Pica, Tarapacá region (20°28′S, 69°18′W, elevation 1320 m).

Continental Chile faces an impending risk of vector-borne disease emergence. *Aedes aegypti* was first detected on Easter Island in 2000 and in continental Chile in 2015, Arica region, 18°27′S, 70°21′W, elevation 200 m). In March 2002, the first dengue case was confirmed in an Easter Island resident with no travel history.[2] In the past decade, the frequency and magnitude of dengue outbreaks have increased in neighboring countries, and cases are regularly imported to continental Chile (28 cases to date, 2023), increasing the risk of local transmission. Continental Chile remains the only South American country without autochthonous dengue transmission.

Since 2022, dengue and chikungunya cases have escalated across the Americas,[3] including the temperate southern cone, the range limit of transmission. Concurrent dengue and chikungunya outbreaks are ongoing in Argentina. Due to heightened arbovirus activity, Argentina's Ministry of Health declared a public health emergency on April 18, 2023. Between December 2022 and May 2023 (EW 20/2023), 106,672 dengue cases were reported, with 99,456 autochthonous cases and 59 deaths.[4]

In 2023 Argentina and Uruguay reported the first instances of local chikungunya transmission.[3] In Argentina, 1993 chikungunya cases were detected (EW 52/2022 to 20/2023), with 1336 autochthonous cases, while Uruguay reported 73 chikungunya cases (52 autochthonous).

Paraguay has also experienced recent large-scale arboviral epidemics,[5] with a major dengue epidemic in late 2019–early 2020. The country is currently experiencing an explosive chikungunya epidemic. This outbreak, driven by the East-Central-South-Africa (ECSA) genotype, has alarmed all countries in the region as it is among the largest reported in the Americas.

Climate change is a critical driver of arboviral transmission. Rising temperatures,[6] shifting rainfall and humidity,[6] and the genetic plasticity of *Ae. aegypti* facilitate the ongoing expansion of the mosquito's range.[7] Global forecasting models predict an expansion of vector distribution and disease transmission under all climate change scenarios. Arbovirus transmission responds to ambient temperature due to the thermal biology of mosquitoes.[8] Climate change is projected to increase net and new exposures to *Aedes*-borne viruses, with the most extreme increase in *Ae. albopictus*-borne transmission under intermediate climate change scenarios; more severe scenarios are expected to produce poleward shifts in arboviruses and broader exposure of humans to *Ae. aegypti*.[8] Shifting distributions are aggravated by insecticide resistance in vectors. Several countries are exploring new biotechnologies for control.[9]

Regional cooperation—including sharing data, surveillance and control tools, expertise, and supplies—is urgently needed to respond to arboviruses. South

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American countries have a history of transnational cooperation in response to health emergencies. In the mid-20th century, a unanimously-supported campaign led by national vector control services, the Pan American Health Organization (PAHO), and ministries of health led to the eradication of *Ae. aegypti* throughout most of South America.[10] Another example is the Southern Cone Initiative formed in 1991 by Argentina, Bolivia, Brazil, Chile, Paraguay, and Uruguay to control Chagas disease (*Triatoma* vectors), reducing the disease.[9] National collaboration between malaria control programs along the coastal border of Ecuador–Peru during the mid-1990s–2010s led to local malaria elimination. In 2003, PAHO introduced an integrated management plan for *Ae. aegypti* across sectors with coordination among sub-regions.[9] The resurgence and emergence of *Aedes* vectors and viral epidemics over the last 20 years is a clear call to action. Bi-national and multinational collaboration is needed to respond to this public health emergency.

As globalization, urbanization, and climate change alter our communities, arbovirus importation and subsequent local transmission will continue. Addressing these challenges requires a transdisciplinary systems-thinking approach, uniting scientists from diverse disciplines, public health practitioners, urban planners, civil society, and the private sector to co-develop solutions. Equitable collaborations can facilitate the sharing of resources across nations with similar challenges, including the Southern Cone. These partnerships have the potential to generate the tools and evidence that are urgently needed to guide policies that protect the health of populations worldwide.

"Eradication campaigns cannot be restricted by the boundaries of any one country."

(Camargo, 1967).[10]

Contributors
ELE, RS, MAR and AMSE: conceptualisation, writing - original draft, writing - review & editing; SA, CJBP and PEPE: writing - review & editing. All authors have read and agreed with the final manuscript submitted.

Declaration of interests
The authors state that no conflicts of interest exist.

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