



Evaluation of the epidemiological surveillance system in the reduction of infectious diseases in Ecuador

Evaluación del sistema de vigilancia epidemiológica en la reducción de enfermedades infecciosas en Ecuador

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ABSTRACT

Objective: To evaluate the epidemiological surveillance system in the reduction of infectious diseases in Ecuador based on scientific papers published between 1999 and 2024. **Method:** Descriptive document review at the national level, using 17 scientific articles as the population. **Results and conclusion:** Seventeen scientific articles were used as the population. The Ecuadorian epidemiological surveillance system has made significant achievements in mitigating infectious diseases; however, challenges remain in regional coverage, data quality, and technological integration. Overcoming these gaps through territorialised cooperative work and the implementation of digital and genomic tools will strengthen early detection and rapid response, ensuring continued progress in public health. **Descriptors:** health services research; epidemiology; uses of epidemiology. (Source, DeCS).

RESUMEN

Objetivo: realizar una evaluación del sistema de vigilancia epidemiológica en la reducción de enfermedades infecciosas en Ecuador desde el aporte de trabajos científicos publicados en el periodo 1999 al 2024. **Método:** revisión documental descriptiva de alcance nacional, se empleó como población 17 artículos científicos. **Resultados y conclusión:** Se empleó como población 17 artículos científicos. El sistema de vigilancia epidemiológica ecuatoriano ha conseguido logros importantes en la mitigación de enfermedades infecciosas; empero, persisten desafíos en cobertura regional, calidad de los datos e integración tecnológica. Superar estas brechas desde un trabajo cooperativo territorializado, así como la implementación del uso de herramientas digitales y genómicas fortalecerá la detección precoz y la respuesta rápida, asegurando la continuidad de los avances en salud pública. **Descriptor:** investigación en servicios de salud; epidemiología; usos de la epidemiología. (Fuente, DeCS).

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Short original



INTRODUCTION

Epidemiological surveillance is a fundamental pillar for the prevention and control of infectious diseases, as it enables the timely detection of outbreaks, the monitoring of trends, and the evaluation of the impact of public health interventions (1). In Ecuador, the geographical and sociodemographic diversity from the coastal region to the Amazon poses particular challenges for the coverage and quality of reporting systems (6,9). Despite advances in infrastructure and training of health personnel, gaps remain in data integration and rapid response to health emergencies (2,4).

On the other hand, scientific evidence has documented the effectiveness of active surveillance in reducing cases of dengue and other arboviruses (16), as well as the contribution of molecular surveillance to characterising foci of bacterial resistance (4). However, it is necessary to comprehensively evaluate the performance of the national epidemiological surveillance system to guide improvements that ensure continuous, responsive surveillance adapted to regional particularities.

The objective of this article is to evaluate the epidemiological surveillance system in the reduction of infectious diseases in Ecuador based on scientific studies published between 1999 and 2024.

METHOD

A descriptive documentary review was conducted at the national level, focusing on the evaluation of Ecuador's epidemiological surveillance system from 1999 to 2024.

Seventeen scientific articles directly contextualised to Ecuador were used as the population, retrieved from the following databases:

Scopus: 3 articles



PubMed: 8 articles

Scielo: 4 articles

Other databases: 2 articles

MeSH and DeCS terms were used: 'surveillance', 'epidemiological surveillance', 'Ecuador', 'infectious diseases', 'public health system'.

Documentary content analysis was applied to evaluate the information relevant to the research objective.

RESULTS

The analysis of the national epidemiological surveillance system reveals substantial progress in the containment of infectious diseases in Ecuador. After strengthening active and passive surveillance mechanisms between 2017 and 2021, a significant decrease in the incidence of gestational malaria (6), infant giardiasis (8) and dengue in endemic areas in the north of the country (11) has been documented.

These findings are consistent with Cartelle-Gestal et al., who describe how strengthening epidemiological data collection and processing reduces neglected tropical diseases (1). Similarly, Vitale et al. demonstrated that active surveillance for dengue fever is more sensitive than the passive model, allowing for early detection of outbreaks and enabling more timely responses (16).

However, gaps remain in the coverage and quality of the information reported. In response, Soria-Segarra et al. identified foci of resistant Gram-negative bacilli in urban hospitals, evidence of possible underreporting of nosocomial infections and limiting the effectiveness of interventions (4). This deficiency is exacerbated by



regional disparities in laboratory infrastructure and human talent training, as warned by Torres et al. in their study on chronic diseases (2).

The geographical heterogeneity of surveillance resources is another critical challenge in the Amazon, where malaria and Chagas disease remain endemic. Bracho-Á et al. and Aguilar V et al. found that, despite local improvements, coverage does not reach the thresholds necessary to interrupt transmission (6,9). It is therefore urgent to adapt strategies to specific sociodemographic and access characteristics, incorporating solutions such as remote telemetry and satellite networks in areas with difficult coverage.

Similarly, Chandler et al. highlight the need to standardise reporting protocols for chronic mycoses such as mycetoma and to seamlessly coordinate primary and secondary care (3). Without these improvements, the true magnitude of fungal infections will continue to be underestimated, affecting resource allocation and staff training.

Public health policies must go beyond strengthening supplies and equipment. It is therefore a priority to implement interoperable digital platforms that facilitate real-time data analysis and genomic surveillance, as molecular epidemiology studies of resistant bacilli show that routine genomic sequencing optimises the identification of transmission chains and guides targeted interventions (4).

Therefore, although the overall trend points to a reduction in multiple infectious diseases, surveillance should not be relaxed during inter-epidemic periods. Experience with chikungunya and dengue between 2014 and 2017 shows that a reduction in control measures can trigger epidemic rebounds (10). Similarly, phylogenetic analysis of dengue strains in different population sizes highlights the



complexity of transmission and the need to continuously adjust surveillance strategies (11).

CONCLUSION

The Ecuadorian epidemiological surveillance system has made significant achievements in mitigating infectious diseases; however, challenges remain in regional coverage, data quality, and technological integration. Overcoming these gaps through territorialised cooperative work and the implementation of digital and genomic tools will strengthen early detection and rapid response, ensuring continued progress in public health.

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CONFLICT OF INTEREST

There is no conflict of interest with individuals or institutions linked to the research.

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CONTRIBUTION OF THE AUTHORS

Jonathan Alexander González-Cano: Contributed to the conceptualisation, development and writing of the article, and was responsible for analysing the results obtained from the selected articles and interpreting the data in the context of Ecuador. Nahin Benjamín Cisneros-Zumba: Was responsible for analysing and synthesising scientific articles related to infectious diseases and epidemiological surveillance in the country, contributing to the identification of gaps in the coverage and quality of reporting and surveillance systems. Viviana Gabriela Avecillas-Morejón: Participated in the collection of information from secondary sources,



contributing to the document review and identification of the main infectious diseases affecting Ecuador. Ruth Elizabeth Salazar-Imbaquingo: Her collaboration focused on identifying challenges at the local and regional levels, particularly in areas most affected by diseases such as malaria and dengue, reviewing the final draft of the manuscript, and adapting it to editorial standards.

REFERENCES

1. Cartelle Gestal M, Holban AM, Escalante S, Cevallos M. Epidemiology of Tropical Neglected Diseases in Ecuador in the Last 20 Years. *PLoS One*. 2015;10(9):e0138311. doi:10.1371/journal.pone.0138311
2. Torres I, Sippy R, Bardosh KL, et al. Chronic kidney disease in Ecuador: An epidemiological and health system analysis of an emerging public health crisis. *PLoS One*. 2022;17(3):e0265395. Published 2022 Mar 16. doi:10.1371/journal.pone.0265395
3. Chandler DJ, Escalante L, Maldonado A, Tello S, Orellana S, Escalante E. Mycetoma in Ecuador. *Trans R Soc Trop Med Hyg*. 2024;118(5):339-342. doi:10.1093/trstmh/trad098
4. Soria-Segarra C, Soria-Segarra C, Molina-Matute M, et al. Molecular epidemiology of carbapenem-resistant gram-negative bacilli in Ecuador. *BMC Infect Dis*. 2024;24(1):378. Published 2024 Apr 6. doi:10.1186/s12879-024-09248-6
5. Calvopiña M, Guamán-Charco E, Ramírez K, et al. Epidemiology and clinical features of venomous snake bites in the Northern Amazon of Ecuador (2017-2021). Epidemiología y características clínicas de las mordeduras de serpientes venenosas en el norte de la Amazonía del Ecuador (2017-2021). *Biomedica*. 2023;43(1):93-106. Published 2023 Mar 30. doi:10.7705/biomedica.6587
6. Bracho Á, Guerrero ML, Molina G, Rivero Z, Arteaga M. Prevalence of gestational malaria in Ecuador. Prevalencia de malaria gestacional en Ecuador. *Biomedica*. 2022;42(1):127-135. Published 2022 Mar 1. doi:10.7705/biomedica.6184
7. Hajri T, Angamarca-Armijos V, Caceres L. Prevalence of stunting and obesity in Ecuador: a systematic review. *Public Health Nutr*. 2021;24(8):2259-2272. doi:10.1017/S1368980020002049
8. Sandoval-Ramírez T, Seco-Hidalgo V, Calderon-Espinosa E, et al. Epidemiology of giardiasis and assemblages A and B and effects on diarrhea and growth trajectories during the first 8 years of life: Analysis of a birth cohort



- in a rural district in tropical Ecuador. *PLoS Negl Trop Dis*. 2023;17(11):e0011777. Published 2023 Nov 20. doi:10.1371/journal.pntd.0011777
9. Aguilar V HM, Abad-Franch F, Racines V J, Paucar C A. Epidemiology of Chagas disease in Ecuador. A brief review. *Mem Inst Oswaldo Cruz*. 1999;94 Suppl 1:387-393. doi:10.1590/s0074-02761999000700076
 10. Cabrera M, Córdova-Lepe F, Valero-Cedeño N, Reyes-Baque J, Rodríguez-Morales AJ. Chikungunya in Ecuador, 2014-2017: Maps and more. *Travel Med Infect Dis*. 2019;29:63-66. doi:10.1016/j.tmaid.2019.04.004
 11. Márquez S, Lee G, Gutiérrez B, et al. Phylogenetic Analysis of Transmission Dynamics of Dengue in Large and Small Population Centers, Northern Ecuador. *Emerg Infect Dis*. 2023;29(5):888-897. doi:10.3201/eid2905.221226
 12. Márquez S, Lee G, Gutiérrez B, et al. Análisis filogenético de la dinámica de transmisión del dengue en centros poblados grandes y pequeños, norte de Ecuador. *Emerge infecta dis*. 2023; 29(5):888-897. doi:10.3201/eid2905.221226
 13. San Sebastián M, Játiva R, Goicolea I. Epidemiology of malaria in the Amazon basin of Ecuador. *Rev Panam Salud Publica*. 2000;7(1):24-28. doi:10.1590/s1020-49892000000100004
 14. Zurita J, Denning DW, Paz-Y-Miño A, Solís MB, Arias LM. Serious fungal infections in Ecuador. *Eur J Clin Microbiol Infect Dis*. 2017;36(6):975-981. doi:10.1007/s10096-017-2928-5
 15. Vásconez-González J, Izquierdo-Condoy JS, Fernandez-Naranjo R, et al. Severe Chagas disease in Ecuador: a countrywide geodemographic epidemiological analysis from 2011 to 2021. *Front Public Health*. 2023;11:1172955. Published 2023 Apr 18. doi:10.3389/fpubh.2023.1172955
 16. Vitale M, Lupone CD, Kenneson-Adams A, et al. A comparison of passive surveillance and active cluster-based surveillance for dengue fever in southern coastal Ecuador. *BMC Public Health*. 2020;20(1):1065. Published 2020 Jul 6. doi:10.1186/s12889-020-09168-5
 17. Boucourt Rodríguez E, Izquierdo Cirer A, Bernal Martínez E, Acosta Gaibor MP. Epidemiological surveillance and prevention of emerging and re-emerging infectious diseases. *JSR [Internet]*. 2022;7(CININGEC II):338-66.



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