Health Affairs ISSN - 0278-2715 Volume 13 ISSUE 8 page 4240-4246
Journal link: https://health-affairs.com/
Abstract Link: https://health-affairs.com/13-8-4240-4246/
August 2025

Epidemiological Trends of Infectious Diseases: Global Patterns and New Challenges

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Abstract

Background:

Infectious diseases remain a significant source of morbidity and mortality worldwide despite the advancements achieved by medical science and public health. Their epidemiological patterns have dramatically shifted as a result of globalization, climate change, antimicrobial resistance, and human–animal interactions.

Objectives:

The article aims to study global infectious disease trends, identify key epidemiological changes, and discuss emerging challenges that are most likely to impact prevention and control strategies in the future.

Methods:

A narrative study of peer-grouped literature, World Health Organization (WHO) epidemiological reports, and global health surveillance reports between the period 2000–2025 was conducted in an effort to identify changing patterns of disease as well as determinants at play.

Results:

Decline in vaccine-preventable diseases in high-income nations, but their resurgence in low immunization coverage areas. Zoonotic diseases, antimicrobial resistance, and vector-borne diseases are on the rise worldwide. Two summary tables give an overview of the distribution of priority infectious diseases and emergent threats.

Conclusion:

Infectious disease trends demonstrate the interconnectedness of health, society, and environment. Surveillance intensification, equitable vaccination programs, and innovative approaches to addressing antimicrobial resistance are essential to addressing future global challenges.

Keywords: Infectious diseases, epidemiology, antimicrobial resistance, emerging infections, global health

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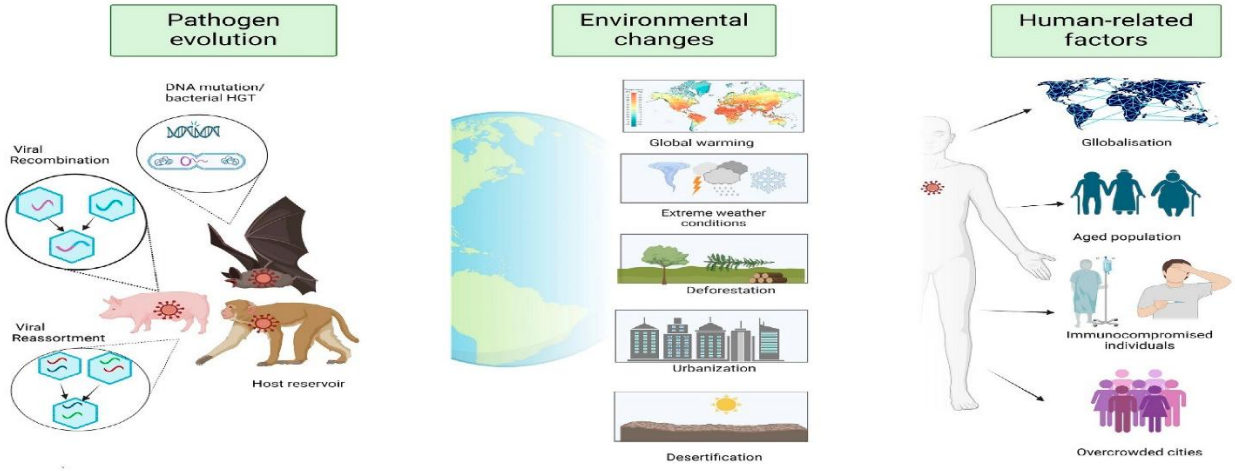
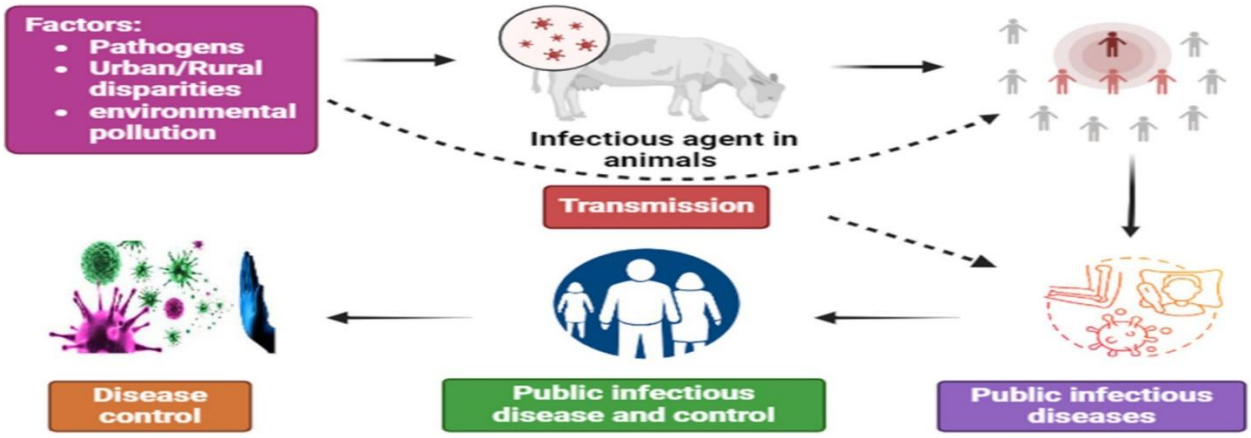
Introduction

Infectious diseases have for centuries shaped the course of human civilization, shaping population migration, economic development, and public health priorities [1]. The 20th century witnessed major advances in infectious disease control through vaccination campaigns, the discovery of antibiotics, and improved sanitation [2]. Eradication of smallpox, reduction of cases of polio, and victory over measles and diphtheria were hailed as megahits for modern medicine. But the 21st century has proven that infectious diseases still represent an omnipresent and changing challenge [3].



Several reasons lie behind the resurgence and re-emergence of infectious diseases in the last couple of decades. Globalization has increased mobility, and pathogens have become able to travel across borders with unexampled speed [4]. Climate change has stretched the range of vectors such as mosquitoes, resulting in such infections as dengue, chikungunya, and Zika virus [5]. Urbanization and population combined together to form favorable conditions for outbreaks, while deforestation and wildlife contact enhance zoonotic spillover, such as the Ebola virus and the COVID-19 pandemic [6]. One of the most highlighted threats is antimicrobial resistance, decreasing the efficacy of current treatments and potentially reversing the last half-century of progress in infectious disease control [7]. The World Health Organization estimates that AMR would cause 10 million deaths annually by the year 2050 if left unchecked. Additionally, variations in health systems, immunization programs, and access to healthcare mean that low- and middle-income countries continue to bear the lion's share of infectious disease morbidity and mortality [8].



Epidemiological surveillance remains critical in tracking these trends, identifying hotspots, and guiding interventions. The global health community has emphasized integrated approaches includes "One Health," where the interconnectedness of human, animal, and environmental health is addressed [9]. The COVID-19 pandemic highlighted weaknesses in health systems and the imperative for coordinated international action. This article studies the major epidemiological trends of infectious diseases over the past two decades, focusing on shifting patterns, emerging threats, and global challenges in disease prevention and management [10]. By synthesizing current data, it highlights both achievements and persistent gaps in infectious disease control, providing a foundation for developing more resilient health systems.

Methodology

This study employed a systematic literature search on PubMed, Scopus, and WHO databases between the years 2000 and 2025. The search terms were "infectious diseases," "epidemiology," "global health," "emerging infections," and "antimicrobial resistance." Peer-grouped literature, WHO surveillance reports, and CDC global health statistics were screened for utility. Relevant studies that covered global trends, emerging pathogens, and changes in epidemiology were included. Data were synthesized thematically to provide an integrated overview of infectious disease trends.

Results

The study depicted a double epidemiological trend: spectacular improvement in the control of vaccine-preventable disease in the developed world, at the same time as the alarming rise of emerging and re-emerging infections across the globe. Zoonosis and vector-borne diseases accounted for an expanding percentage of outbreaks. Antimicrobial resistance was consistently cited as a major threat to health worldwide.

Table 1: Global Burden of Major Infectious Diseases (2000–2025)

Disease	Estimated Cases (Millions)	Key Trends
HIV/AIDS	39	Declining incidence, but high prevalence in Sub-Saharan Africa
Tuberculosis	10.7	Slow decline, multidrug-resistant TB rising

Disease	Estimated Cases (Millions)	Key Trends
Malaria	248	Stable burden, climate-driven resurgence in some regions
Measles	8	Resurgence linked to declining immunization
COVID-19 (since 2019)	>710	Global pandemic with lasting socioeconomic impact

Table 2: Emerging Infectious Disease Threats

Disease/Pathogen	Transmission Route	Emerging Concern
Zika Virus	Mosquito-borne	Expanded range due to climate change
Ebola Virus	Zoonotic	Sporadic outbreaks with high mortality
Antimicrobial Resistance	Healthcare & community	Threatening antibiotic effectiveness
Avian Influenza (H5N1)	Zoonotic	Risk of pandemic potential
Monkeypox	Human-to-human/zoonotic	Increasing outbreaks in non-endemic regions

Discussion

The findings point to the complex and evolving epidemiology of infectious diseases during the modern era [11]. While advances in vaccines, diagnostics, and therapeutics have made seemingly dramatic strides, the consistent emergence of new and persistence of existing diseases reflect profound vulnerabilities [12]. One of the starkest trends is the geographic spread of vector-borne diseases. Climate change has remapped patterns of rainfall, temperature, and humidity, enabling mosquitoes to move into new areas [13]. Dengue and chikungunya, hitherto confined to the tropics, are today reported in subtropical and even temperate regions. This poses a challenge for healthcare systems that have not been accustomed to handling these diseases [14]. Another source of concern is the re-emergence of vaccine-preventable illnesses like measles and pertussis, often driven by vaccine skepticism, misinformation, and underdeveloped immunization infrastructure in low-resource environments [15]. Such a phenomenon not only undermines herd immunity but also highlights inequities in access to life-saving vaccinations. Antimicrobial resistance emerges as a cross-cutting threat, crossing bacterial, viral, and parasitic infections [16]. Transmission of multidrug-resistant tuberculosis and resistant gonorrhea strains are exemplars of the growing failure to treat common infections. AMR is not only a measure of inappropriately prescribed antibiotics but also of deficiencies in stewardship, surveillance, and development of new antimicrobials. Zoonotic diseases have become increasingly common, with over 70% of emerging outbreaks being traced back to animals [17]. The COVID-19 pandemic has shown the calamitous global impact of zoonotic spillovers and reinforced the necessity of early warning systems, international cooperation, and the One Health principle. Medical, veterinary, and environmental professionals need to have closer collaboration in order to predict and avert such risks [18]. Despite these challenges, there is progress. Global HIV incidence has decreased through higher antiretroviral therapy, and polio is all but eliminated. Genomic monitoring, quick diagnostics, and electronic technologies have given rise to new tools to trace out and track outbreaks. Equitable uptake, however, is a predominant barrier in low-resource settings [19]. Briefly, infectious disease epidemiology represents a dynamic

interplay of biological, environmental, and social determinants. Prevention, innovation, and equity must be integrated into future strategies to preserve global health.

Conclusion

Epidemiologic trends in infectious disease reflect a world of accomplishment and persistent threats. Vaccines, therapies, and improved public health interventions have reduced the impact of a lot of infections, but new diseases, antimicrobial resistance, and international inequities continue to challenge health systems. Managing these challenges takes strong surveillance, global collaboration, equitable provision of vaccines, and ongoing investment in research. The experiences of the past few decades, especially the COVID-19 pandemic, highlight the importance of building on preparedness and embracing integrated One Health solutions to achieve a healthier world.

References

1. Acosta-España, J. D., Romero-Alvarez, D., Luna, C., & Rodriguez-Morales, A. J. (2024). Infectious disease outbreaks in the wake of natural flood disasters: Global patterns and local implications. *Le Infezioni in Medicina*, *32*(4), 451.
2. McHardy, J., Marquizo, A. B., Bettcher, D., & Gakidou, E. (2025). Policy view: worldwide patterns of tobacco use with recommendations for tobacco control. *The Lancet Respiratory Medicine*, *13*(8), 756-768.
3. Chen, W., Chen, Y., Cheng, Z., Chen, Y., Lv, C., Ma, L., ... & Zhu, Y. (2024). Global patterns of syphilis, gonococcal infection, typhoid fever, paratyphoid fever, diphtheria, pertussis, tetanus, and leprosy from 1990 to 2021: findings from the Global Burden of Disease Study 2021. *Infectious Diseases of Poverty*, *13*(1), 66.
4. Nuha, N., Ali Pitchay, S., Ab Halim, A. H., Sahbudin, M. A. B., & Sahbudin, I. (2025). Beyond the outbreak: a review of big data analytics in proactive infectious disease prevention for risk mitigation for COVID-19. *Journal of Big Data*, *12*(1), 185.
5. Wang, S., Li, W., Wang, Z., Yang, W., Li, E., Xia, X., ... & Chiu, S. (2024). Emerging and reemerging infectious diseases: global trends and new strategies for their prevention and control. *Signal transduction and targeted therapy*, *9*(1), 223.
6. Rahmat Ullah, S., Jamal, M., Rahman, A., & Andleeb, S. (2024). Comprehensive insights into Klebsiella pneumoniae: unravelling clinical impact, epidemiological trends and antibiotic-resistance challenges. *Journal of Antimicrobial Chemotherapy*, *79*(7), 1484-1492.
7. Vinsensia, D., Amri, S., Sihotang, J., & Sihotang, H. T. (2024). New Method for Identification and Response to Infectious Disease Patterns Based on Comprehensive Health Service Data. *MATRIK: Jurnal Manajemen, Teknik Informatika dan Rekayasa Komputer*, *23*(3), 583-592.
8. Igwama, G. T., Olaboye, J. A., Maha, C. C., Ajegbile, M. D., & Abdul, S. (2024). Big data analytics for epidemic forecasting: Policy Frameworks and technical approaches. *International Journal of Applied Research in Social Sciences*, *6*(7), 1449-1460.
9. Branda, F., Giovanetti, M., Romano, C., Benvenuto, D., Ciccozzi, A., Sanna, D., ... & Scarpa, F. (2024). Global measles surveillance: trends, challenges, and implications for public health interventions. *Infectious Disease Reports*, *16*(2), 367-379.
10. Elemuwa, C. O., Raimi, M. O., Ainu, M., Adias, T. C., Ufuoma, R. S., Elemuwa, U. G., ... & Obermeier, P. E. (2024). Conquering mpox: A comprehensive public health strategy for addressing mpox and poxvirus infections in nigeria–understanding global trends, transmission dynamics, and effective prevention and control measures in nigeria. *JMIR Preprints*, *14*(10), 2024.

11. Lee, P. I., Hsueh, P. R., Chuang, J. H., & Liu, M. T. (2024). Changing epidemic patterns of infectious diseases during and after COVID-19 pandemic in Taiwan. *Journal of Microbiology, Immunology and Infection*, *57*(5), 685-690.
12. Abbasi, E. (2025). Advancing insights into visceral leishmaniasis: challenges, innovations, and future directions in global disease management. *Innovations, and future directions in global disease management*.
13. Huang, D., Lai, H., Shi, X., Jiang, J., Zhu, Z., Peng, J., ... & Chen, J. (2024). Global temporal trends and projections of acute hepatitis E incidence among women of childbearing age: age-period-cohort analysis 2021. *Journal of Infection*, *89*(4), 106250.
14. Hornuss, D., Göpel, S., Walker, S. V., Tobys, D., Häcker, G., Seifert, H., ... & DZIF R.-NET Study Group Peña Diaz LA Pilarski G. Thoma N. Peyerl-Hoffmann G. Gölz H. Joost I. Mathé P. Gillis M. Vehreschild M. Wille J. Steffens B. Blum Y. Kleipass M. Lenke D. Herold S. Schmiedel J. Lengler A. Buhl M. Hölzl F. Dinkelacker A. (2024). Epidemiological trends and susceptibility patterns of bloodstream infections caused by Enterococcus spp. in six German university hospitals: a prospectively evaluated multicentre cohort study from 2016 to 2020 of the R-Net study group. *Infection*, *52*(5), 1995-2004.
15. Ikejezie, J., Miglietta, A., Nezu, I. H., Adele, S., Higdon, M. M., Feikin, D., ... & Mahamud, A. (2024). Informing the pandemic response: the role of the WHO's COVID-19 Weekly Epidemiological Update. *BMJ Global Health*, *9*(4), e014466.
16. McClymont, H., Lambert, S. B., Barr, I., Vardoulakis, S., Bambrick, H., & Hu, W. (2024). Internet-based surveillance systems and infectious diseases prediction: an updated review of the last 10 years and lessons from the COVID-19 pandemic. *Journal of Epidemiology and Global Health*, *14*(3), 645-657.
17. Ugwu, O. P. C., Alum, E. U., Ugwu, J. N., Eze, V. H. U., Ugwu, C. N., Ogenyi, F. C., & Okon, M. B. (2024). Harnessing technology for infectious disease response in conflict zones: Challenges, innovations, and policy implications. *Medicine*, *103*(28), e38834.
18. Zhang, S. X., Wang, J. C., Yang, J., Lv, S., Duan, L., Lu, Y., ... & Zheng, J. X. (2024). Epidemiological features and temporal trends of the co-infection between HIV and tuberculosis, 1990–2021: findings from the Global Burden of Disease Study 2021. *Infectious diseases of poverty*, *13*(04), 79-94.
19. Zhou, C., Wang, S., Wang, C., Qiang, N., Xiu, L., Hu, Q., ... & Yin, K. (2025). Integrated surveillance and early warning system of emerging infectious diseases in China at community level: current status, gaps and perspectives. *Science in One Health*, *4*, 100102.