

Preventing Pandemics: Shifting from Reactive to Proactive One Health approaches

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Abstract

Recent public health events like SARS, Avian Influenza, Ebola, Monkeypox, and COVID-19 have highlighted the need to understand emerging risks at the animal-human interface. Pandemics cause significant morbidity, mortality, and economic consequences, emphasizing the importance of pandemic prevention through a One Health strategy. Zoonotic pathogens often originate from the wild but can spill over to humans via domestic animals. Major drivers of zoonotic spillover include deforestation, wildlife trade, livestock farming, urbanization, and habitat fragmentation. Implementing the One Health approach helps understand disease risk factors and develop proactive strategies for preventing future pandemics.

Keywords: Zoonosis, One Health, pandemics

Introduction

Recent public health events such as SARS, Avian Influenza, Ebola viral disease, and Monkeypox – as well as the unprecedented health, economic, and societal impact of the COVID-19 pandemic – have refocused attention on the need to comprehensively understand emerging risks at the animal-human interface. As a result, countries are nearly unanimous on one point: The world cannot afford another pandemic¹.

Pandemics can lead to considerable morbidity and mortality, particularly in vulnerable populations such as children, the elderly, and immunocompromised individuals². They can also have severe economic consequences, including healthcare costs, disruptions to businesses and supply chains, and long-term socioeconomic impacts. This highlights the significance of investing in pandemic prevention through a One Health strategy and adopting proactive measures to forestall pandemics rather than waiting for them to arise.

Zoonotic pathogens typically originate from the wild but can spill over to humans from domestic animals because of their close interaction with wild animals³. In a recently issued white paper by the One Health High-Level Expert Panel (OHHLEP) on zoonotic spill-over prevention, the document states, “It’s clear that pandemic prevention at the source cannot continue as an afterthought – a much larger commitment is overdue and sorely needed to prevent future pandemics”⁴.

Understanding the Risk Drivers

In the 21st century, zoonoses has relentlessly and consistently threatened public health and produced devastating pandemics⁵. Around 80% of pathogens infecting animals are “multi-host,” meaning that they move among different animal hosts, including occasionally infecting humans. Domestic animals and peri-domestic wildlife also act as bridges for the emergence of human diseases⁶.

Tropical deforestation, wildlife trade, intensification of livestock

Farming, unplanned urbanization, and habitat fragmentation are throwing ecosystems out of balance and are considered to be major drivers of zoonotic disease spillover. Close encounters between people and wild animals are relatively uncommon compared to those with domestic animals, but the recent emergence of diseases like Ebola, SARS, and Nipah, highlights the danger that wildlife pathogens pose to global health security⁷. For example- in Bangladesh, bats harboring Nipah virus — which can kill 40–75% of infected people — now roost in areas of high human population density because their forest habitat has been almost entirely cleared.

To understand the rising frequency of spillover events more comprehensively, the OHHLEP is suggesting investigating the following upstream drivers using a systematic review: hunting of wild animals, captive wild animals, live wild animal trade, trade in wild animal products, agricultural expansion for farming livestock,

intensification of livestock farming, extensive livestock farming, climate change, urbanization, and habitat fragmentation⁸.

By implementing the One Health approach we can gain a deeper understanding of the complex web of factors contributing to disease risk and develop proactive strategies to prevent and mitigate potential outbreaks. This requires transdisciplinary approaches, with a systemic focus on the health of animals, humans, and ecosystems, and it will be only through a collaborative risk-based approach that prevention and preparedness for future health emergencies can be ensured.

Risk reduction Measures

Strategies to address upstream determinants for risk reduction at the animal side include (but are not limited to): Improved biosecurity measures at livestock farms and wet markets, better veterinary care, strengthened surveillance, and increasing awareness for hot spot areas for pathogen spillover and related risk reduction measures, reporting for animal diseases and instituting early quarantines to limit pathogen spread.

In addition, investing in conservation initiatives would have the potential to safeguard biodiversity and global health security. Wildlife conservation efforts should aim at reducing human-wildlife interactions in the wildlife trade by protecting wildlife habitats and providing local communities with alternative protein sources.

Conducting joint risk assessments to evaluate the potential impact of a pathogen and developing strategies to reduce the associated risk is a proactive approach⁹. This includes assessing the pathogen's transmissibility, severity, and potential for spillover from animals to humans. Continuous monitoring of high-risk areas, such as wildlife markets and areas experiencing ecological disruptions, can help identify and mitigate potential threats.

How can the sectors work together?

"Just as health emergencies have impacts across many sectors, so must our preparedness and response efforts span sectors, disciplines, and pathogens. It is critical, too, that community engagement and equity are the centre of our efforts, especially for those populations that are marginalized and most at risk." - Tedros Adhanom Ghebreyesus, WHO Director-General speaking at the launch of PRET (Preparedness and resilience for emerging threats), 26 April 2023¹².

While One Health may need no further advocacy¹⁰, given the clarion calls after the COVID-19 pandemic, the real test of its adoption will lie in the field implementation at both national and sub-national levels. The quadripartite (WHO, FAO, OIE, and UNEP) have

revisited the entirety of the definition of 'One health' which is defined as an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent.¹¹

In most cases, the sectors do come together briefly for the reactive response phase, only to be dismantled once the acute public health event is over. The siloed approaches of thinking and working and short-term address of the acute issues at hand, will not be able to generate the vision needed for protecting the health of the animals, people, and the planet.

For countries where one health needs greater traction at the national/ field level, periodically looking at the country profile of emerging zoonoses threats (for a large country- this to include subnational/local epidemiology as well) and jointly addressing risk assessments, risk profiling and planning for targeted strategies, recognizing specific local vulnerabilities and concurrent health threats/disasters opens considerable room for multi-sectoral dialogue across the one health landscape.

Moreover, addressing public health events through a One Health approach has significant subsequent economic co-benefits; for example, reducing deforestation is estimated to create \$4 billion per year in social benefits from reduced greenhouse gas emissions¹³. Recurrent episodes of Nipah virus outbreaks in Kerala for instance require an understanding complex relationship between the ecological niche within which the spillover events occur, including addressing the risk drivers, habitat loss, role of sentinel animals, and the potential for further zoonotic disease transmission.

Rethinking health emergency preparedness- Moving towards an ecosystem approach

The latest document from WHO on health emergency preparedness and response (HEPR) calls for a strategic shift towards an ecosystem approach with a focus on strengthening core health emergency components: collaborative surveillance; community protection; safe and scalable care; access to countermeasures; and emergency coordination. Furthermore, with the formation of a Quadripartite following the formal inclusion of the UN Environmental Programme (UNEP) into the Tripartite (FAO-WOAH-WHO) in 2022¹⁴, and with the subsequent launch of the global One Health Joint Plan of Action (OH JPA) (2022-26)¹⁵, the commitment towards ecosystem approach has further strengthened.

Strong integrated disease surveillance, efficient

laboratory capacity and diagnostics for pathogen and genomic surveillance, and collaborative approaches for event detection, risk assessment, and response monitoring are all necessary to strengthen collaborative surveillance.

While efforts are being made to achieve a truly equitable and globally accessible genomic surveillance network, it remains a challenge that requires sustained investment, collaboration, and support from the international community. Evidence has shown that low-income countries continue to have limited genomic surveillance capabilities¹⁶. Following the pandemic, the need for a robust genomic surveillance capability has become even more pressing¹⁷.

The pandemic brought many opportunities- for coordination beyond the health sector, and these lessons need to be institutionalized and well-documented. Sustaining whole of society- whole of government approaches should be possible for preparedness and readiness activities but requires clear leadership and strong governance models.

A system thinking approach for readiness and community resilience needs to be at the heart of the health security agenda, including addressing contextual vulnerabilities. The complexity and connectivity of multi-source surveillance need to be addressed while recognizing the benefit of sharing intelligence, early information sharing, and data sharing best practices. This may necessitate formal administrative arrangements (such as a Memorandum of Understandings/legal/administrative framework) to provide an agreed institutional framework for sectors to converge.

A silent pandemic of antimicrobial resistance (AMR)

The silent pandemic of antimicrobial resistance (AMR) also continues to take a toll on patients and their families, leading to prolonged infections, extended and costly hospital stays, and preventable deaths. Sub-optimal infection control practices, agricultural contaminants in the environment, improper management, and consumption of antimicrobials both in animals and humans, together with the migration of animals/people infected with drug-resistant pathogens continue to facilitate the spread of resistance. If treatment is not administered in accordance with a stringent AMR policy and without adhering to prescription guidelines during a health emergency, it may aggravate AMR and treatment results.

Effective management of antimicrobial resistance (AMR) necessitates stringent and effective regulation of antimicrobial types and dosages used in medical and veterinary practices, in addition to tracking and controlling the spread of resistant bacteria into the environment by implementing the One Health strategy outlined in the AMR national action plan.¹⁸

What gets measured gets done

WHO has provided several tools for monitoring and evaluating core capacities under the IHR (2005) and the legal instrument itself is being reviewed globally to incorporate some of the recommendations being made by the Member States. However, its full application and implementation would be possible through continuous improvements for pandemic preparedness made through regular exercises (tabletop/ drills/simulation scenarios), using after-action reviews to improve National Action Plans for Health security, and assessing/elevating public health workforce capacity with an all-hazard approach. Capacities at Points of Entry (Ports, airports, and ground crossings) can be assessed using available tools for PoE, and contingency plans need to be tested regularly based on periodic risk assessments and functional exercises.

Exercises planned well can encourage multi-sectoral involvement and cooperation. There is a need for greater advocacy for multisectoral participation in the conduct of e SPAR and the use of other tools such as Joint External evaluation (including at the sub-national level)

Along similar lines, the World Organization of Animal Health (WOAH) (an intergovernmental organization responsible for developing standards for animal health) has developed the Performance of Veterinary Services (PVS) Pathway, which is composed of a range of tools to assist countries to objectively assess and address the main weaknesses of their Veterinary Services. To analyze and improve the collaboration between the two sectors in the prevention, detection, and response to Pandemics arising from zoonotic diseases, the two organization recommends conducting a WHO-WOAH IHR-PVS National Bridging Workshops (NBWs) to identify bridging opportunities between the two sectors, as well as next steps and activities needed to strengthen national capacities relevant to the animal-human interface¹⁹.

The OH Joint Plan of Action provides comprehensive technical guidance to countries for collective and coordinated action to mainstream the One Health approach.¹⁵ Build around six interdependent action tracks, the OH-JPA provides a clear roadmap to countries to collectively contribute to achieving sustainable health and food systems, reduced global health threats and improved ecosystem management.

Conclusion

Preventing pandemics necessitates a shift from a reactive to a proactive (multi-pronged- One Health) approach thereby recognizing and resolving possible pandemic risks before they become global crises. By considering the broader impacts of pandemics, we must involve multiple sectors and disciplines in a way that protects not only individual health but also the stability and well-being of communities, societies, animals, and ecosystems. Preparedness efforts should not be limited to specific pathogens but rather focus on building systems that can respond to a wide array of infectious agents. By taking such proactive measures with a strong focus on the ecosystem approach, we can prevent future pandemics from emerging at the animal-human interface.

Disclaimer

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Conflicts of Interest

None.

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