Emerging and Re-Emerging infectious diseases

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Introduction

- *"You are posted in Pediatrics. A 9-year-old presents with fever, conjunctivitis, cough, and a rash starting from the face.*
- *You confidently say, **'Looks like measles**,'*
- *but your senior says:*

  Measles? In 2025? Are you sure?

  We almost eliminated it… remember?

- **"Can diseases we've vaccinated against make a comeback?"**
- **"What factors could allow an eradicated disease to re-emerge?"**

Introduction

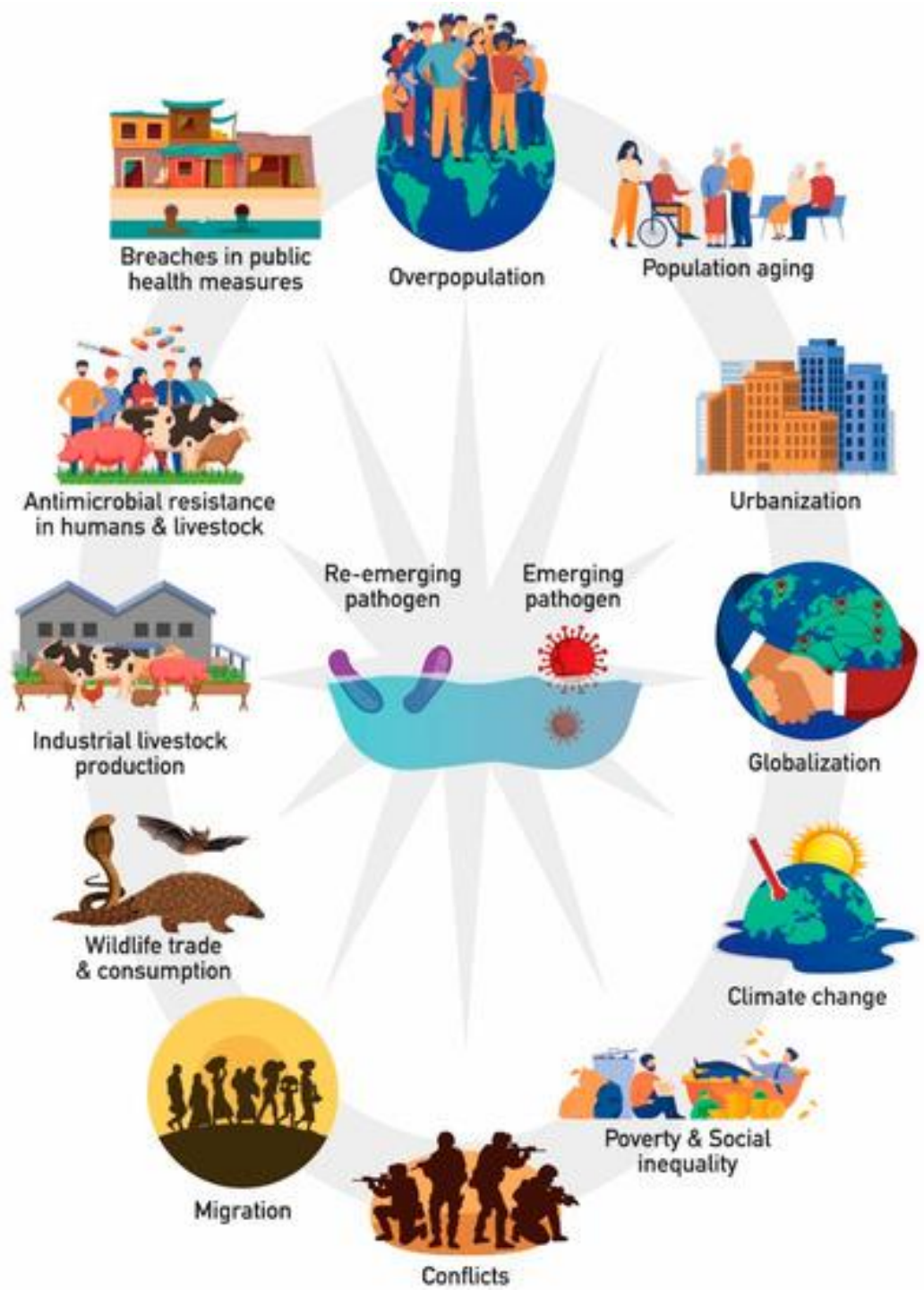
- Today, we'll discuss ***why* we are seeing diseases return,** that we thought were history.
- **Some times new diseases will also emerge.**
- High-consequence pathogens such as filoviruses (e.g., Ebola), Hantaviruses, and Flaviviruses (e.g., West Nile, Zika), which have emerged due to ecological disruption and globalization.
- Paramyxoviruses like Nipah and Hendra have emerged from bat reservoirs, underlining the role of wildlife in spillover events.

Case Studies of EIDs and RIDs

- Yersinia pestis, the causative agent of plague, remains a potent example of reemergence under conditions of poor sanitation and animal-human contact.
- From viral encephalitis in Bihar to Nipah in Kerala and scrub typhus in Uttarakhand, India is at the crossroads of old diseases returning and new ones emerging.
- **These examples illustrate not only pathogen adaptability but also the fragility of global health readiness.**

Factors responsible

- Unplanned and Under planned urbanization
- Overcrowding and rapid population growth
- Poor sanitation
- Inadequate public health infrastructure
- Resistance to antibiotics
- Increased exposure of humans to disease vectors and reservoirs of infection in nature
- Rapid and intense international travel
- Microbial genetic mutation



Factors responsible for EIDs and ReEIDs

https://www.mdpi.com/2076-2607/10/1/98?utm_source=chatgpt.com

Emerging infectious diseases

- During past 30 years 30 new diseases have emerged.

- If it is new disease,
  - **the treatment options are limited,**
  - **vaccination options are also limited**
  - **and finally possibility to control the disease are limited**

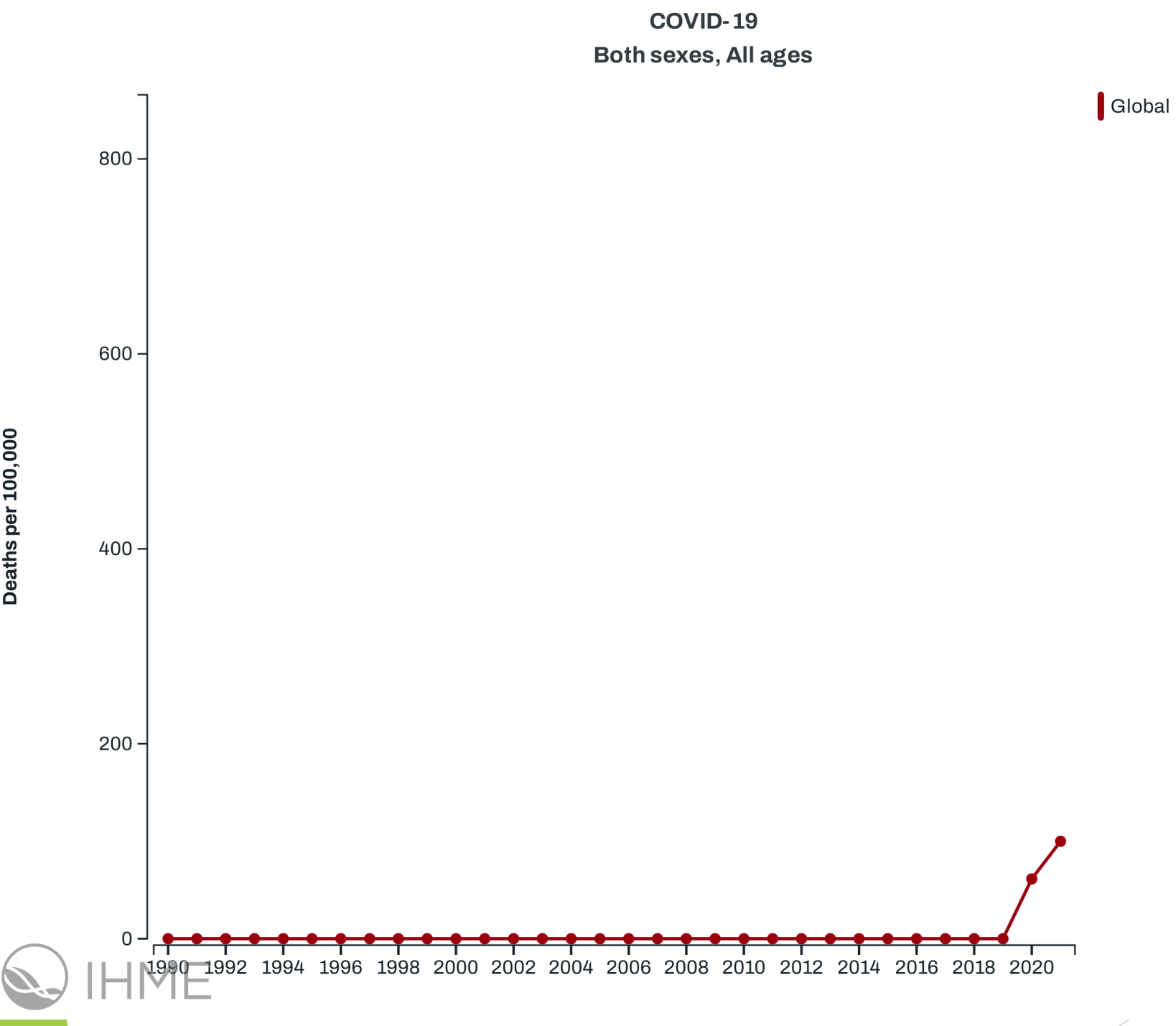
Emerging infectious diseases

- Emerging diseases are those **whose incidence in humans has increased during the last two decades** or which threaten to increase in future

- The term also refers to **newly appearing infectious diseases**, or **disease that are spreading to new geographical areas** – such as cholera in South America and Yellow fever in Kenya

Examples of Emerging infectious diseases

- COVID – 19 - Pandemic
- Human monkey pox – 2022 – Several countries
- Tomato fever (Tomato flu) – 2022 – Kerala Tamilnadu
- AIDS - 1983
- Ebola virus disease – African countries
- Hanta Virus – 1993 - Brazil
- Escherichia coli – New strains – 1992 – China, Thailand
- SARS – 2002 – China, Hongkong, Singapore


COVID-19
Both sexes, All ages
Global
Deaths per 100,000
800
600
400
200
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020

Re-emerging infectious diseases

- Diseases that were **previously controlled** by chemotherapy and antibiotics, but now they have **developed antimicrobial resistance** and are **often appearing in epidemic form**.

Examples of Re-emerging infectious diseases

- **Tuberculosis** – Multi Drug resistant Tuberculosis
- **Malaria** – Double resistance problem
- **Nosocomial infections caused by Enterococci** – Developed resistance to all antibiotics except vancomycin
- **ARI infections -** caused by Pneumococci and Hemophilus influenzae
- **STDs -** caused by Neisseria gonorrhoea
- **Diarrhoea** - caused by Shigella dysenteriae

Factors causing Anti-microbial Resistance

Category	Specific Factors	Quantitative Notes
Human misuse	Overprescription, non-compliance	~50% antibiotic use unnecessary
Veterinary overuse	Use in feed, mass medication	>70% of antibiotics globally in animals
Hospital issues	Poor hygiene, HAIs, contaminated instruments	Methicillin-resistant Staphylococcus aureus (MRSA) common in Indian ICUs
Environmental factors	Pharma waste, contaminated water	High AMR in effluent-heavy zones

Factors causing Anti-microbial Resistance

Category	Specific Factors	Quantitative Notes
Drug pipeline stagnation	Fewer new antibiotics	Only a handful in pipeline (WHO)
Regulatory failure	OTC sales, fake drugs	India among top OTC antibiotic consumers
Behavioral/social	Misuse due to ignorance, economics	Common in Low- and Middle-Income Countries like India

Difference between Re-emerging infectious diseases and Cyclical trend

- **Cyclic Trend:** It shows Natural seasonal variation. Generally predictable.
- **Example:** Influenza, Chickenpox

- **Re-emerging Disease:** Its resurgence after previous decline. Often unpredictable
- **Example:** TB, Measles, Dengue

How Do We Identify Emerging Diseases?

- Syndromic surveillance
- Laboratory diagnosis (PCR, ELISA, culture)
- Community-based reports
- Outbreak investigations
- WHO & ICMR alerts
- Genomic surveillance

Mechanisms Established in India

- IDSP (Integrated Disease Surveillance Programme)
- NCDC (National Centre for Disease Control)
- ICMR-NIV (Virus Research Labs)
- National Health Mission (NHM)
- EIS officers for field epidemiology
- Media scanning and verification cell

Bioterrorism

- Beyond natural emergence, **bioterrorism** is now recognized as a critical dimension in infectious disease emergence.
- **The deliberate release of anthrax in the early 2000s** spotlighted the intersection of security and health, and emphasized the necessity of preparedness for both natural and engineered outbreaks

Global Health Preparedness and Response

- In the 21st century, the **World Health Organization's International Health Regulations (IHR)** and the Global Health Security Agenda have sought to strengthen national capacities in **disease surveillance, response, and risk communication.**

- **Investments in One Health approaches, which integrate human, animal, and environmental health, are increasingly recognized as essential to preventing EIDs and RIDs.**

Conclusion

- Emerging and reemerging infectious diseases remain one of the **greatest threats to global health**.
- Their **multifactorial causation** demands integrated, interdisciplinary, and globally coordinated strategies.
- **Surveillance, rapid response systems, antimicrobial stewardship, and One Health investments** must be central to preparedness plans.
- As history and current events remind us, **no nation is immune, and global solidarity is key** to defeating these invisible threats.

Thank you