Pandemic Preparedness

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Westminster Gardens – Great Decisions

March 19, 2024

Photo credit: WHO / Pierre Albouy

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Roadmap

- Infectious disease pandemics: key concepts
- Modern historical pandemics
- International Health & the WHO
- COVID-19: Lessons learned & planning for future pandemics

Discussion

Reading: Pandemic Preparedness, Topic 8, Great Decisions 2024 Edition, by Carolyn Reynolds

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About me

- Epidemiologist
- Focus: research on chronic disease epi & neurodegenerative disorders
- Teaching >20 years
- Childhood obesity prevention through garden-based education programs
- COVID-19: research, consulting, advising

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Themes

» The next pandemic is not a question of "if", but "when"
» No country can vaccinate its way out of a pandemic
» There is a repeating cycle of panic and neglect around pandemics

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Let's get our discussion started with some key concepts…

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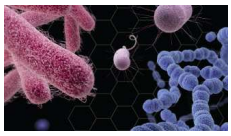
Infectious versus chronic disease

Infectious

- Caused by heterogeneous pathogens: bacteria, viruses, fungi, parasites, prions
- Can be communicable and non-communicable
- Constantly emerging, re-emerging, evolving



Chronic

- Generally noncontagious origin, uncertain etiology, cannot be prevented by immunization, multiple risk factors, long latency period, cannot be cured, long course of illness, functional impairment or disability, does not necessarily resolve on its own
- Many can be prevented by modifying behavioral risk factors

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Patterns of occurrence of disease in populations

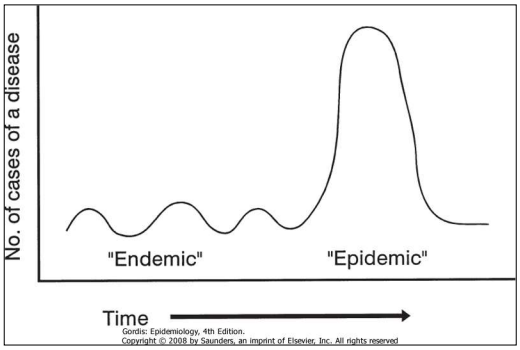
Endemic = the "background" level of disease that is normal for a population in a geographic area at a given time

Epidemic = the occurrence of a disease at a level that is higher than normal background or expected

Outbreak = a localized epidemic

Pandemic = an epidemic that spans more than one country

PHEIC = Public Health Emergency of International Concern



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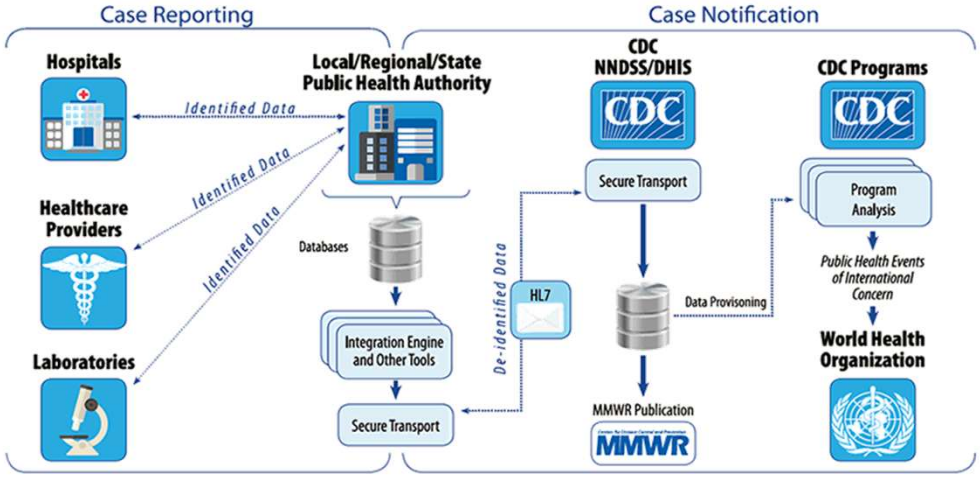
How do we know the level of disease in a population?

Disease surveillance: **The systematic collection, collation, analysis and dissemination of data pertaining to the occurrence of specific diseases**



https://wwwn.cdc.gov/nndss/data-collection.html

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Reportable diseases: LAC

Los Angeles County Department of Public Health

Reports to the State of California DPH

>85 communicable diseases, any disease that occurs at an unusually high incidence and that has public health importance

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Zoonoses (zoonotic disease)

Humans coexist in a complex, interdependent relationship with animals we depend on for our food, livelihoods, and well-being, and shared environments (Human-animal-ecosystem interface)

Pathogens transmitted to humans from animals (direct), sometimes via an intermediate species (indirect)

"Spillover": rare event when a virus moves from one species to another

Unknown

Slide adapted from Stacey Davis

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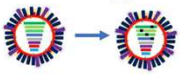
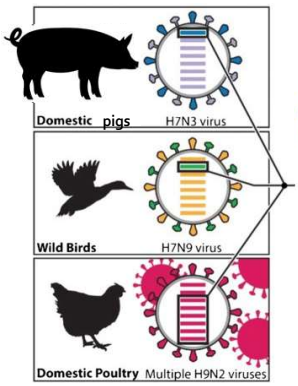
Antigenic variation: Influenza virus

Unknown

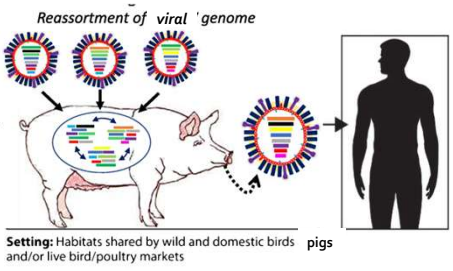
I. Antigenic drift

Gradual accumulation of genetic variation





II. Antigenic shift



Result: "new" virus that humans don't have immunity to

https://www.researchgate.net/publication/326750989_Zoonotic_Influenza_and_Human_Health-Part_1_Virology_and_Epidemiology_of_Zoonotic_Influenzas

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Why do new diseases emerge?

Factor	Examples
Ecological changes (including those due to economic development and land use)	Agriculture; dam construction, changes in water ecosystems; deforestation/reforestation; flood/drought; famine; climate change; habitat change, introduction of new host
Human demographics, behavior	Population growth, urbanization; war or civil conflict; intravenous drug use
International travel commerce	Worldwide movement of goods and people; air travel
Technology and industry	Globalization of food supplies; changes in food processing and packaging; organ or tissue transplantation; drugs causing immunosuppression; widespread use of antibiotics
Microbial adaptation and change	Microbial evolution, response to natural selection (eg., antibiotic-resistant bacteria, antigenic drift in influenza virus)
Breakdown in public health measures	Curtailment or reduction in prevention programs; inadequate sanitation and vector control measures

Morse SS. Factors in the Emergence of Infectious Diseases. *Emerging Infectious Diseases*. 1995;1(1):7-15. doi:10.3201/eid0101.950102.

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Modern Historical Pandemics

https://hub.jhu.edu/2020/04/09/alexandre-white-how-pandemics-shape-society/

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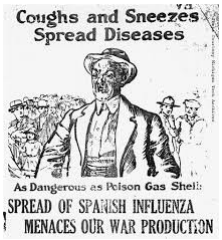
1918: Spanish flu

- Avian H1N1 (reconstructed 2005)
- Spread in 3 distinct waves during 1918-19 across Europe, Asia, North America
  - US, 2nd wave est. 280/1000 people had clinical sxs
- Coincided with WWI
- Started mild, became extremely virulent
  - Attack rate: 20-30% in adults, 30-45% in children
  - Case fatality: 15-50% in adults esp young adults, pregnant women
  - Estimated 20-50 million deaths first 12 months
- Primary viral pneumonia, secondary bacterial pneumonia



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SARS-CoV-1, 2003

- Appeared in Southern China Nov 2002
- China did not inform the WHO until Feb 2003 & downplayed number of cases
- Prominent Beijing doctor acted as a whistleblower April 2003
- Pandemic ended June 2003
  - 28 countries; 8,422 cases, 774 deaths, 11% case-fatality rate
- China embarrassed & apologized
- WHO credited with leading a rapid response

https://www.businessinsider.com/deadly-sars-virus-history-2003-in-photos-2020-2
https://www.who.int/csr/sars/goarn2003_4_16/en/

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Ebola virus, West Africa 2013-2016

- Dec 2013: Index case reported : 18-month-old boy from a village in Guinea infected by bats (zoonotic)
- Spread to Liberia and Sierra Leone
- Aug 2014: WHO declared PHEIC
- Spread to Senegal, Spain, UK & secondary infection in Italy, Mali, Nigeria, US
- 2016: outbreak ended with more than 28,600 cases & 11,325 deaths
- Ebola virus disease caused by Ebolavirus
  - illness progresses from "dry" to "wet" symptoms as the person becomes sicker
  - High case-fatality rate (average ~50%)

WHO / Esther Ruth Mbabazi

https://www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/index.html 17

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Themes

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- **No country can vaccinate its way out of a pandemic**
- There is a repeating cycle of panic and neglect around pandemics

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What is preparedness?

» Pandemic preparedness includes plans for detecting, containing, and rapidly responding to and mitigating the spread of potentially dangerous emerging infectious diseases.

» Components
- Surveillance
- Leadership
- Public health infrastructure
- Availability of supplies, nonpharmaceutical interventions
- Mechanisms to develop vaccines, therapeutics, diagnostics

https://www.cfr.org/report/pandemic-preparedness-lessons-covid-19

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Discussion question: Pandemics and vaccination

» What does it mean to say that "No country can vaccinate its way out of a pandemic"?

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Discussion question: US Role

» Does the United States have an interest and responsibility in helping other countries secure access to lifesaving vaccines, medicines and medical supplies in the event of a global pandemic? Why or why not? Explain.

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International Health: Origins of the WHO

» Circa World War II recognition of need for global cooperation

» United Nations (UN) Charter officially ratified by original signatory States October 24, 1945
- Discussed setting up a global health organization

» World Health Organization Constitution came into force April 1948
- **Objective: attainment by all peoples of the highest level of health**

World Health Organization

https://www.un.org/en/about-us/history-of-the-un; https://www.who.int/about/who-we-are/history

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Overarching role of WHO

Direct and coordinate international health within UN system

Current focus areas:

- health systems
- health through the life-course
- communicable & noncommunicable (NCDs) diseases
- preparedness, surveillance & response
- corporate services

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To achieve its objective

World Health Organization

Article 2 of Constitution identifies 22 functions

A global **hub** of scientific and technical expertise, gathering and analyzing information, issuing guidelines, providing technical advice and assistance to governments, regulating things like quality of medicines, etc.

A **normative agency**, setting goals and agendas (e.g., advocating for universal health care as a human right), and drafting and steering the diplomatic negotiations around international health treaties and regulations.

A political **venue** in which Member States seek to advance their interests.

A chief **convening and coordinating authority** in global health, bringing together the constellation of global health actors to shape policy agendas and technical guidelines.

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What the WHO does and does not do

DOES

- Advise, coordinate global action
- Defer to Member States sovereignty

DOES NOT

- Supply governments with funding
- Have enforcement authority
- Challenge, circumvent or criticize governments

Photo credit: WHO/Y. Shimizu

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International Health Regulations

Photo credit: Laurent Gillieron / Keystone / AP

- Legally binding agreement, Updated in 2005
- WHO Member States (US included) required to:
  - conduct surveillance for all kinds of potential international health threats & report them to WHO in timely manner
  - have the ability to detect, assess, report & respond to health threats
- WHO issue notification (PHEIC) of "serious, unusual or unexpected" health crisis; can use unofficial info but must attempt to verify
  - Director General can issue recommendations, avoiding those which unnecessarily interfere with travel or trade
- WHO powers limited to preserve sovereignty
- No enforcement mechanisms; up to Member States to implement

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Discussion question: the right balance

- COVID-19 exposed the current limitations of international organizations like the WHO to compel countries to cooperate in the face of a global pandemic. As with other international agreement under international law, the Pandemic Agreement now being negotiated by countries seeks to address this by strengthening the global rules of the road for everyone.
- **What is the right balance between promoting global solidarity and protecting national sovereignty?**

Photo credit: Yann Forget

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Themes

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Assessment of international COVID-19 response

May 2021 WHO Panel report: *COVID-19: Make it the Last Pandemic*

Consequences of the pandemic:

- Set back sustainable development by years
- Caused >7 million deaths in 223 countries as of Feb 2024 including >17,000 health workers
- Resulted in the deepest shock to the global economy since WWII & the largest simultaneous contraction of national economies since the Great Depression
- 115-125 million people pushed into extreme poverty
- Students not able to attend school
- Gender-based violence increased, more girls at risk of early marriage
- Women's workload 3-4 times higher
- Long term health effects from infection
- Delays in treatment
- Lapses in screening
- Inequity: impacts not felt equally across the world

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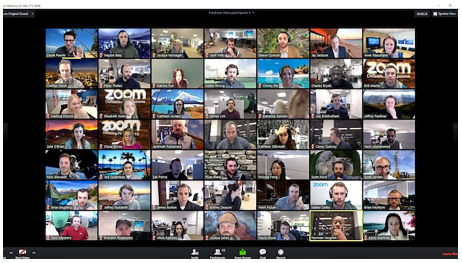
Not all bad: Silver lining of COVID-19

- Medicine & science
  - Production of effective vaccines at rapid speed
  - Improved management of COVID hypoxia
  - Rapid development of telemedicine
  - Progressive use of personal protective equipment (PPE)
  - Greater respect for front-line providers
  - Intensified goals of care conversations and advance care planning
  - Attention on physician mental health
  - Insights into those who refuse vaccination
- Innovations in education, public services, many other industries
- Rapid uptake of online tech and telework
- Flexible work arrangements, reduced commute times



https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9111287/ https://images.app.goo.gl/YiEG8wKMzdVeFns18 https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2021.712111/full

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Pandemic preparedness: international cooperation

The Pandemic Agreement: Member States of the WHO have agreed to a global process to draft and negotiate an agreement under the Constitution of the WHO to strengthen pandemic prevention, preparedness and response.

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Status of WHO Pandemic Preparedness Accord c. Feb 2024

- Member States meet on a regular basis as part of the Intergovernmental Negotiating Body (INB)
- Feb - June 2022: agreed on the way they would work, defining how best to engage various stakeholders
- July 2022: initiated discussions on elements that could become part of a future accord
- December 2022: Conceptual Zero Draft
- Feb – Dec 2023: Negotiation, revision, progress report, discussion
- May 2024: Final draft presented to World Health Assembly

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Recommendations:
The very nature of a pandemic requires global action

- Elevate and sustain political leadership on pandemics at the highest levels
- Ensure every country has the capacity to stop outbreaks at their source
- Provide timely, equitable access to live saving medical countermeasures and tools
- Strengthen global governance and accountability for pandemic threats
- Scale up investments in pandemic preparedness and have resources ready to flow in crisis

Pandemic Preparedness, Great Decisions 2024, Topic 8, by Carolyn Reynolds
https://www.fpa.org/great_decisions/index.cfm?act=topic_detail&topic_id=125

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Discussion question: Investments in prevention

- How do we foster a culture that values and prioritizes investments in pandemic preparedness and prevention in the same way that we do a strong defense? What should the United States do differently both at home and abroad?

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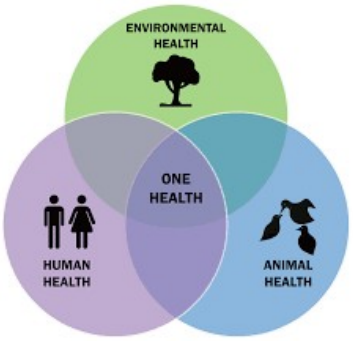
Closing thoughts

» One Health

The One Health context is a concept showing that human, animal, and environmental health are very closely related and inseparable.



This means moving **away from** the attitude that: there is human medicine, there is veterinary medicine and there is environmental medicine, **and towards** a transdisciplinary approach that unites all three.

https://www.leopoldina.org/en/topics/pandemics/emergence-of-pandemics/ 35

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Discussion question: Future pandemics

» What is the most important investment we can make to help stop infectious disease outbreaks from becoming deadly pandemics?

Photo credit: Alexander Ush Wiaplah.

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Thank you

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