Primary prevention of pandemics

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CONSERVATION INTERNATIONAL

Disclaimer

- The views in this presentation are mine and not necessarily that of my employer

- I have no financial conflicts of interest

DEFINITIONS

- Pathogen[1]: an organism that causes disease
- Zoonosis: a disease caused by a human pathogen with a non-human animal source
- Emerging infectious diseases (EIDs)[2]: infectious diseases whose incidence in humans has increased…or threatens to increase in the near future
- Pathogen spillover: transmission of pathogens between animals and people

[1]https://www.healthline.com/health/what-is-a-pathogen
[2]http://wwwnc.cdc.gov/eid/pages/background-goals.htm

LETTERS

Global trends in emerging infectious diseases

Kate E. Jones[1], Nikkita G. Patel[2], Marc A. Levy[3], Adam Storeygard[3]†, Deborah Balk[3]†, John L. Gittleman[4] & Peter Daszak[2]

Vol 451|21 February 2008|doi:10.1038/nature06536

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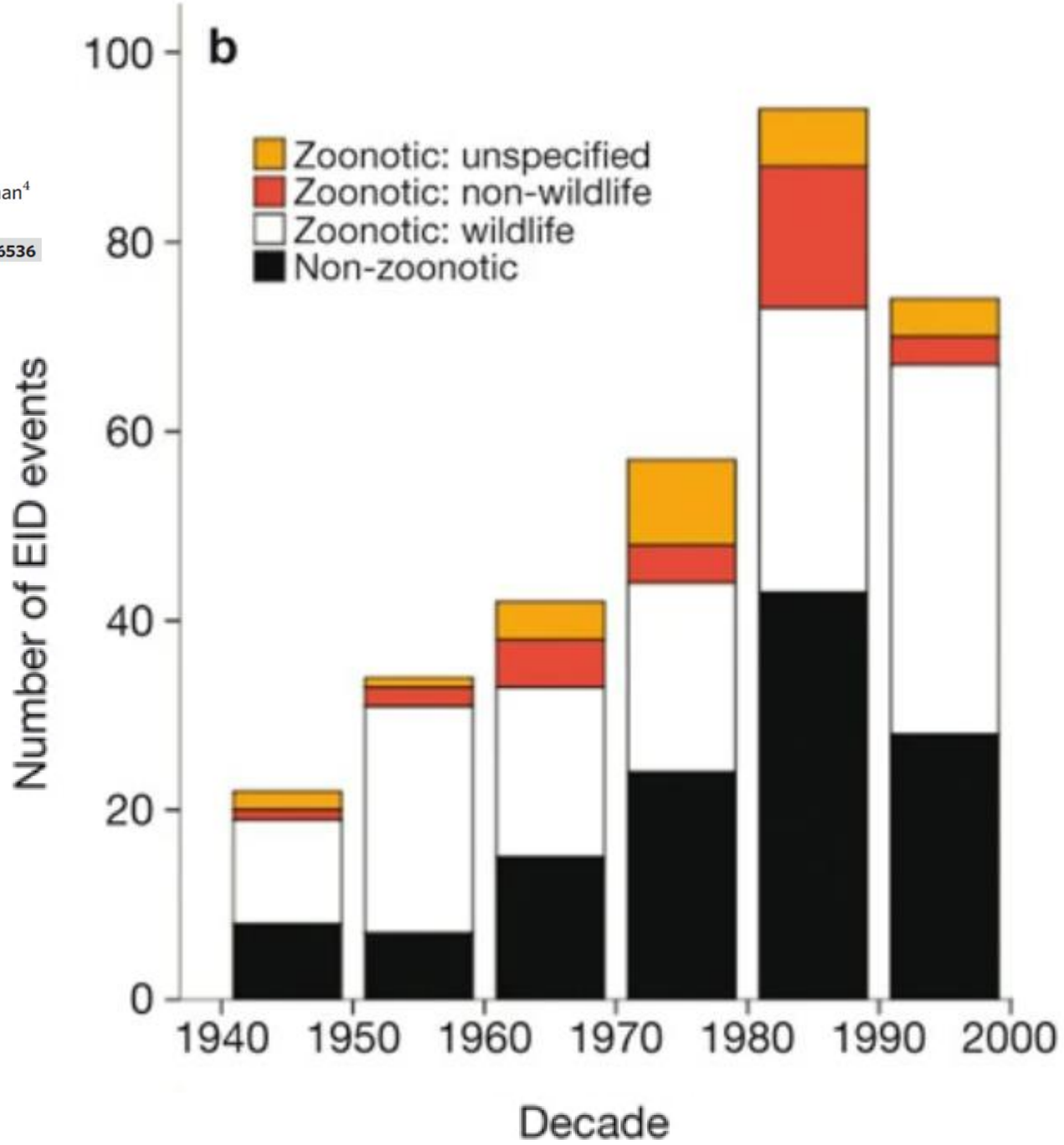
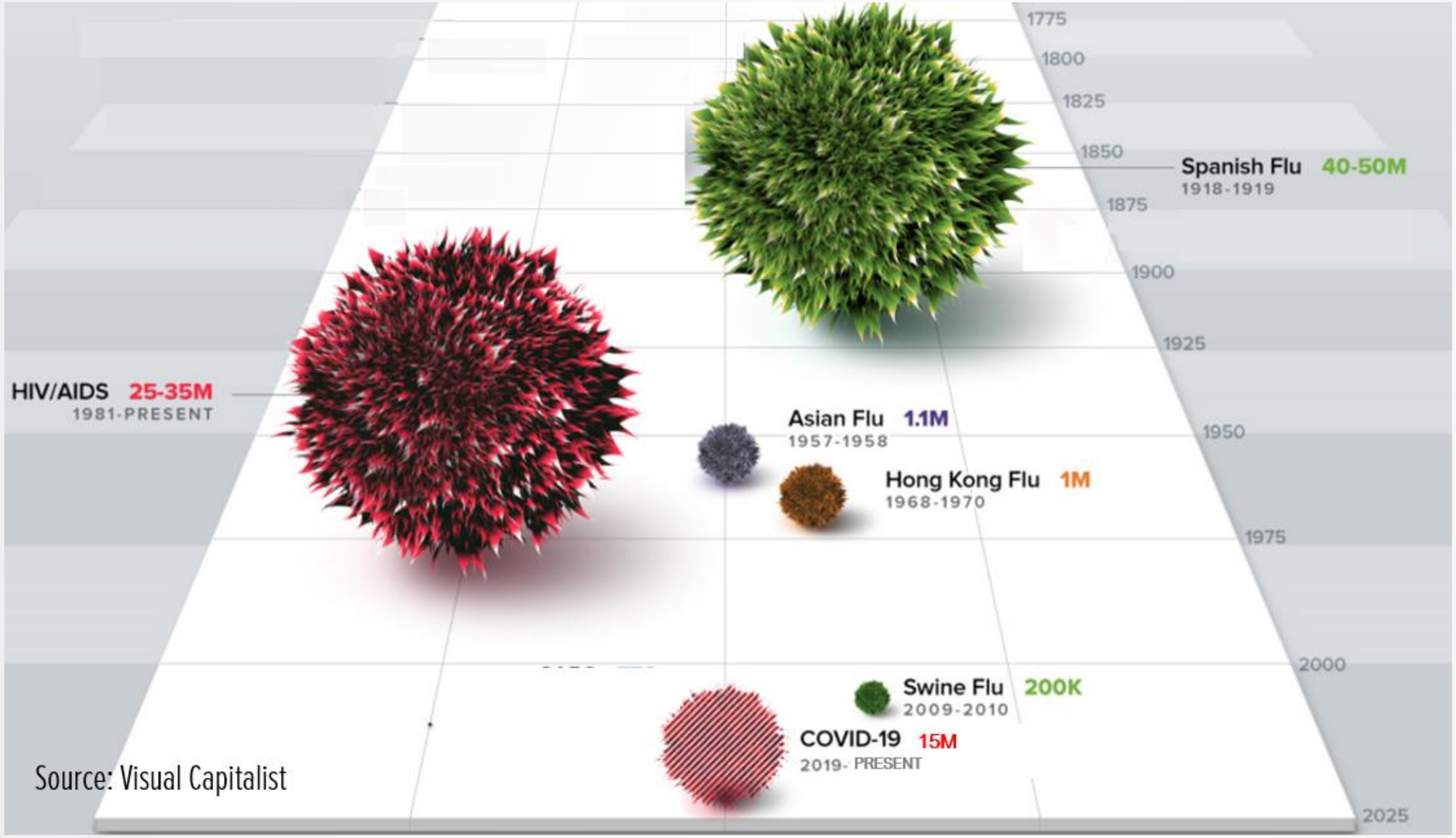


Zoonotic diseases are often high-consequence

- Anthrax
- Rabies
- Severe acute respiratory syndrome (SARS)
- Mpox and other poxvirus infections
- Ebola hemorrhagic fever
- Zika
- HIV infection
- Novel influenza
- COVID-19 (likely)

COVID-19 is not a once-in-a-century event



- There have been at least 6 pandemics in the past century
  - All originated from animals (assuming COVID-19 did)
  - Have caused over 90 million deaths
- Frequency of pandemics is expected to increase

Major drivers of pathogen spillover from animals include…

- Deforestation and forest degradation
- Commercial wildlife trade pipeline
- Poor biosecurity in animal husbandry
- Climate change

Deep dive: deforestation and infectious disease emergence

- Brings humans to the forest edge, increasing opportunities for human and domestic animal contact with wildlife

- Stresses wildlife, increasing their risk of becoming infected with or shedding pathogens
- Causes loss of biodiversity, leaving behind “generalist” species that can survive near humans, which often are the animals that host pathogens (e.g., bats)
- Worsens climate change

Human activities are driving the accelerating pace of pathogen spillover.

COVID has ignited a new global movement to reduce morbidity and mortality from pandemics. Mpox underscores the ongoing threat.

There are now efforts underway at the highest levels of government to correct the failures of past approaches to pandemics.

Addressing pandemics requires investment in Prevention and Preparedness

- Terminology
  - *Prevention: avoiding a pandemic (reducing threat)*
  - *Preparedness: increasing the ability to respond if a pandemic occurs (reducing vulnerability)*

- Under-investment in either of these domains will result in failure to lower the risk of another pandemic occurring or result in mis-management of the next pandemic when it occurs
  - Even now, in discussions on the future of pandemic investments, prevention is often neglected in favor of preparedness

American Pandemic Preparedness: Transforming Our Capabilities

September 2021

Eric S. Lander
Assistant to the President for Science and Technology

Jacob J. Sullivan
Assistant to the President for National Security Affairs

https://www.whitehouse.gov/wp-content/uploads/2021/09/American-Pandemic-Preparedness-Transforming-Our-Capabilities-Final-For-Web.pdf

American Pandemic Preparedness: Transforming Our Capabilities

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Page 7:

"New infectious diseases have been emerging at a quickening pace due to increased **zoonotic transmission from animals, driven by population growth, climate change, habitat loss, and human behavior**"

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Page 7:

"New infectious diseases have been emerging at a quickening pace due to increased **zoonotic transmission from animals, driven by population growth, climate change, habitat loss, and human behavior**"

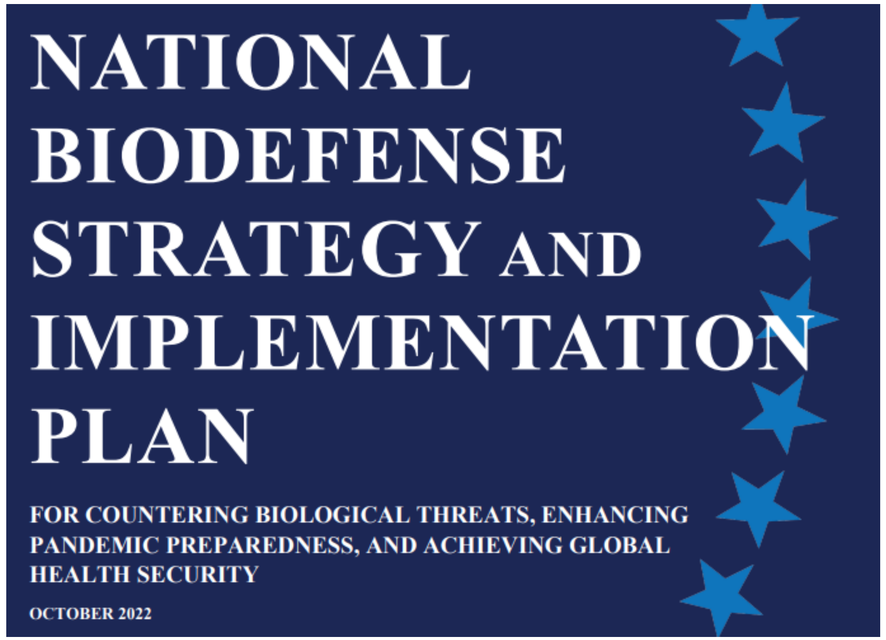
Yet, paradoxically, the document contains **no goals to address spillover**, but does have a goal to prevent laboratory accidents (which is also important).

https://www.whitehouse.gov/wp-content/uploads/2021/09/American-Pandemic-Preparedness-Transforming-Our-Capabilities-Final-For-Web.pdf

Change over time…

- More recent policy from the Biden Administration reflects a shift in their stance

- I'd like to think that advocacy from civil society over the last 2 years played a role



https://www.whitehouse.gov/wp-content/uploads/2022/10/National-Biodefense-Strategy-and-Implementation-Plan-Final.pdf

Pandemic prevention

Pandemic prevention

Secondary prevention:

Containing spread of a pathogen after an outbreak has already occurred to avoid an epidemic or pandemic

Pandemic prevention

Quite often, even though prevention isn't mentioned, decision-makers are implicitly talking about secondary prevention. That's because many of the actions for secondary prevention and pandemic preparedness are related.

Secondary prevention:

Containing spread of a pathogen after an outbreak has already occurred to avoid an epidemic or pandemic

Pandemic prevention

Primary prevention:

Avoiding outbreaks altogether through reducing risk of pathogen spillover, improving laboratory safety, and addressing biological weapons

Pandemic prevention

Based on historical precedent and the ongoing pace of environmental degradation, spillover is the most likely cause of the next pandemic—meaning that reducing risk of spillover must be a priority for public health.

Primary prevention:

Avoiding outbreaks altogether through reducing risk of pathogen spillover, improving laboratory safety, and addressing biological weapons

Preparedness efforts alone are insufficient

- Inequitable distribution of the tools of preparedness
- Emerging infectious diseases often defy conventional wisdom
- “Spillback”
- We live in an age of dis-information and rising populism
- We are **less prepared** for the next pandemic today than we were in 2019

Actions to reduce risk of spillover

- Stop deforestation and forest degradation in heavily forested tropical areas
- Enhance health and economic security of communities living in areas of high deforestation
- Strictly regulate the wildlife trade and wildlife markets involving species that pose a public health risk
- Improve infection control during animal husbandry

https://pubmed.ncbi.nlm.nih.gov/36823026/

Costs and benefits of preventing spillover

- COVID-19 pandemic has cost millions of lives and trillions of dollars

Compared to…

- Preventing pathogen spillover that would cost $20-30 billion per year

POLICY FORUM

ECOLOGY AND ECONOMICS: COVID-19

Ecology and economics for pandemic prevention

SCIENCE 24 JULY 2020 • VOL 369 ISSUE 6502

By Andrew P. Dobson[1], Stuart L. Pimm[2], Lee Hannah[3], Les Kaufman[4], Jorge A. Ahumada[3], Amy W. Ando[5], Aaron Bernstein[6], Jonah Busch[7], Peter Daszak[8], Jens Engelmann[9], Margaret F. Kinnaird[10], Binbin V. Li[11], Ted Loch-Temzelides[12], Thomas Lovejoy[13], Katarzyna Nowak[14], Patrick R. Roehrdanz[3], Mariana M. Vale[15]

https://www.science.org/doi/10.1126/science.abc3189

The Anthropocene

- We are in the midst of a new geological epoch called the Anthropocene
  - Humans are the dominant force shaping the planet's biophysical conditions

- Human impacts on the Earth's natural systems are intensifying exponentially

A paradox

- Human activities that have impacted the Earth's natural systems have led to great improvements in
  - Access to energy
  - Per capita food production (despite population growth)
  - Reduced poverty
  - Health

- State of human health and that of planet's natural systems have been trending in opposite directions

- "We have been mortgaging the health of future generations to realise economic and development gains in the present."

S. Myers. Lancet. 2017.

Human alterations of the global environment have wide-ranging health implications

- Infectious diseases
- Malnutrition
- Non-communicable diseases
- Mental health
- Displacement and conflict

Is nature in a bad place? Yes.

But we haven't lost yet. We must reject the delusion that it's too late to act.

What happens from here is our choice.

What can health researchers do? (1)

- Be bold in our vision for what is needed for a healthy future

- Employ a **One Health and Equity-focused** approach
  - Investigate degradation of the global environment and its human health effects
  - Support future generations of interdisciplinary researchers
  - Build partnerships
  - Broaden research, policy and programmatic structures beyond those focused on narrow disciplines

What can health researchers do? (2)

- Stay informed
- Join coalitions
- Engage in the policy-making process
- Make research endeavors sustainable

What can health researchers do? (3)

- Counter the rampant spread of mis- and disinformation
- Communicate clearly and effectively
- Translate science into action
- Educate study-subjects on planetary health

Conservation is public health.

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