Veterinærinstituttet
Norwegian Veterinary Institute

Escaping the Era of Pandemics

Lessons not learned?
The power of communication and the need for a transformative change

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SCIENCE IN THE NEWSROOM
GLOBAL SUMMIT 2020

Acknowledgements:

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EcoHealth
Alliance

IUCN

SSC
Species Survival Commission

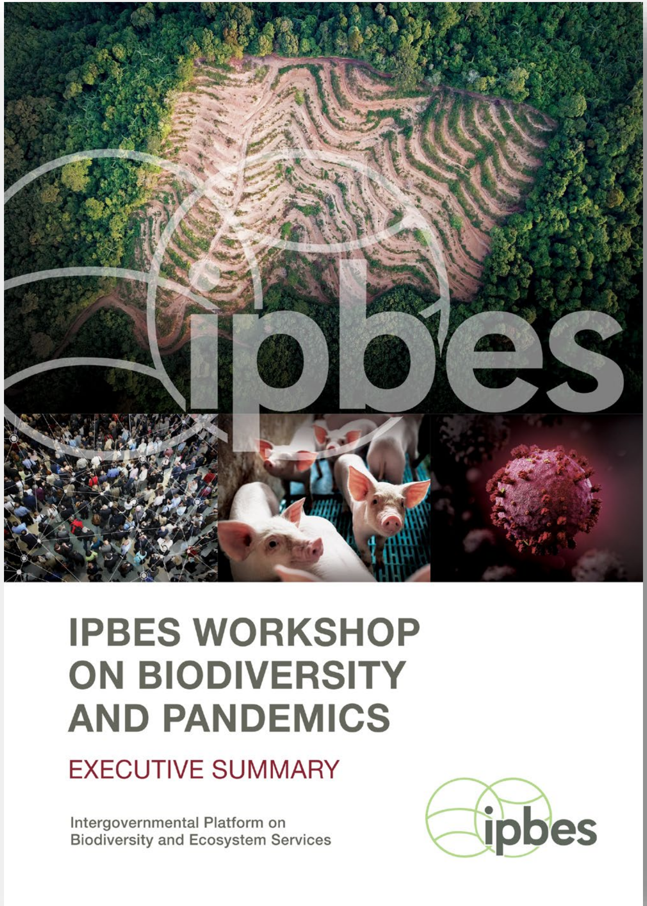
WHSG
Wildlife Health Specialist Group

THE LANCET
One Health Commission

WDA
Wildlife Disease Association
Founded in 1951

THE LANCET
Covid19 Commission

One Health



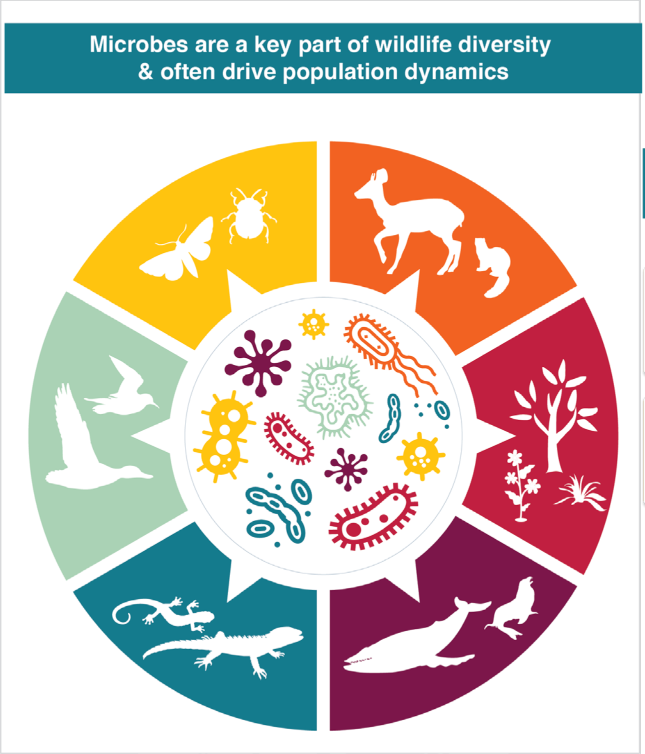
Escaping the 'Era of Pandemics':

Experts Warn Worse Crises to Come

""The same **human** activities that drive **climate** change & **biodiversity** loss also drive **pandemic risk** through impacts on our environment"

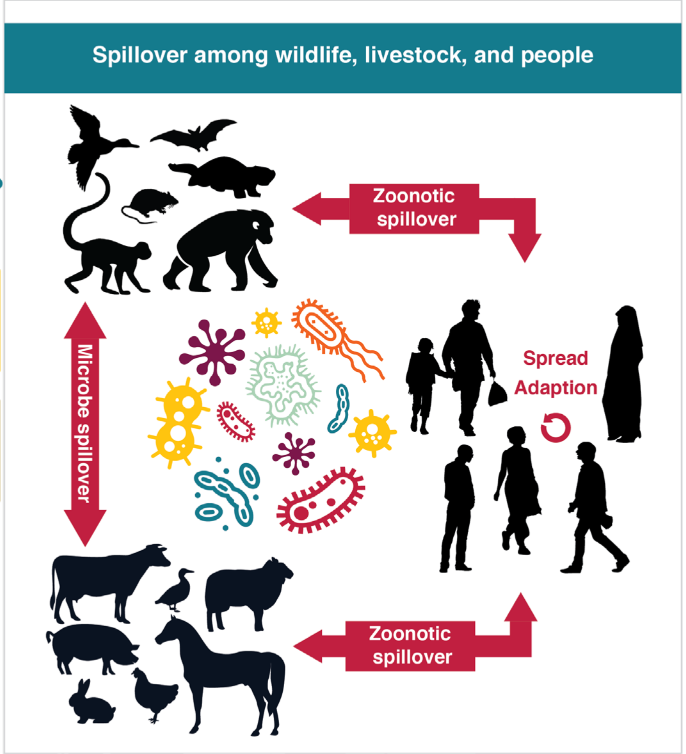
"FUTURE PANDEMICS WILL EMERGE MORE OFTEN, SPREAD MORE RAPIDLY, DO MORE DAMAGE TO THE WORLD ECONOMY AND KILL MORE PEOPLE THAN COVID-19 UNLESS THERE IS A TRANSFORMATIVE CHANGE IN THE GLOBAL APPROACH TO DEALING WITH INFECTIOUS DISEASES" – IPBES REPORT ON PANDEMICS AND BIODIVERSITY

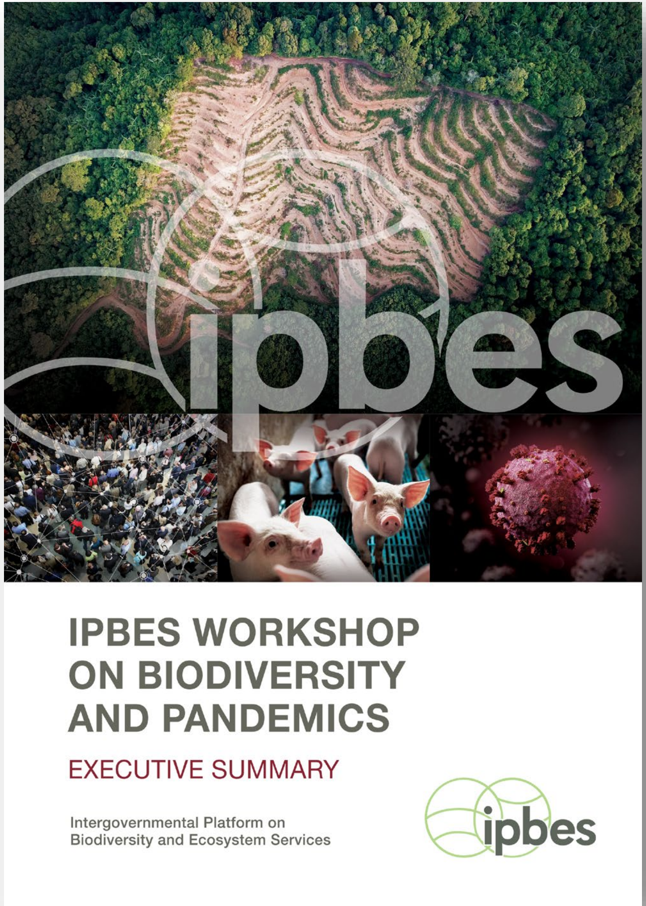
So…who is changing what?



Anthropogenic environmental changes

Land degradation	Microbe communities altered
Habitat loss	Increased interaction among animals & species




ipbes
IPBES WORKSHOP
ON BIODIVERSITY
AND PANDEMICS
EXECUTIVE SUMMARY
Intergovernmental Platform on
Biodiversity and Ecosystem Services
ipbes


#PandemicsReport
The overwhelming scientific evidence points to a very positive conclusion.
We can escape the pandemic era, but this requires a much greater focus on prevention rather than just reaction.
RESTORATION IN PROGRESS
ipbes
Dr. Peter Daszak
Chair, Biodiversity & Pandemics Workshop

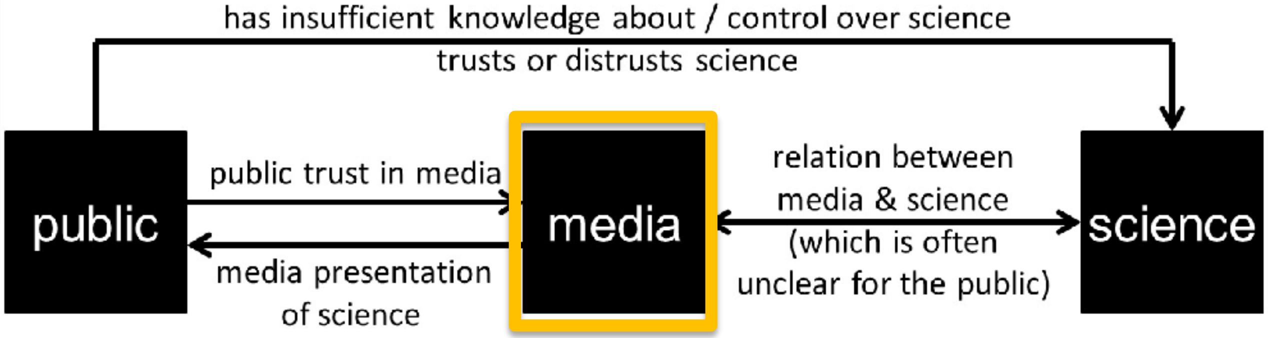

ALLEA
ALL European Academies

Trust in Science and Changing Landscapes of Communication

January 2019

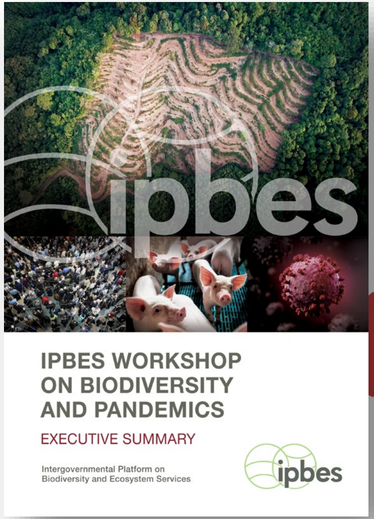
ALLEA DISCUSSION PAPER # 3

"Trust means deferring with comfort and confidence to others, about something beyond our knowledge or power, in ways that can potentially hurt us. In order to establish and maintain trust in science, such comfort and confidence relies on **communication by trustworthy and trusted mediators**."



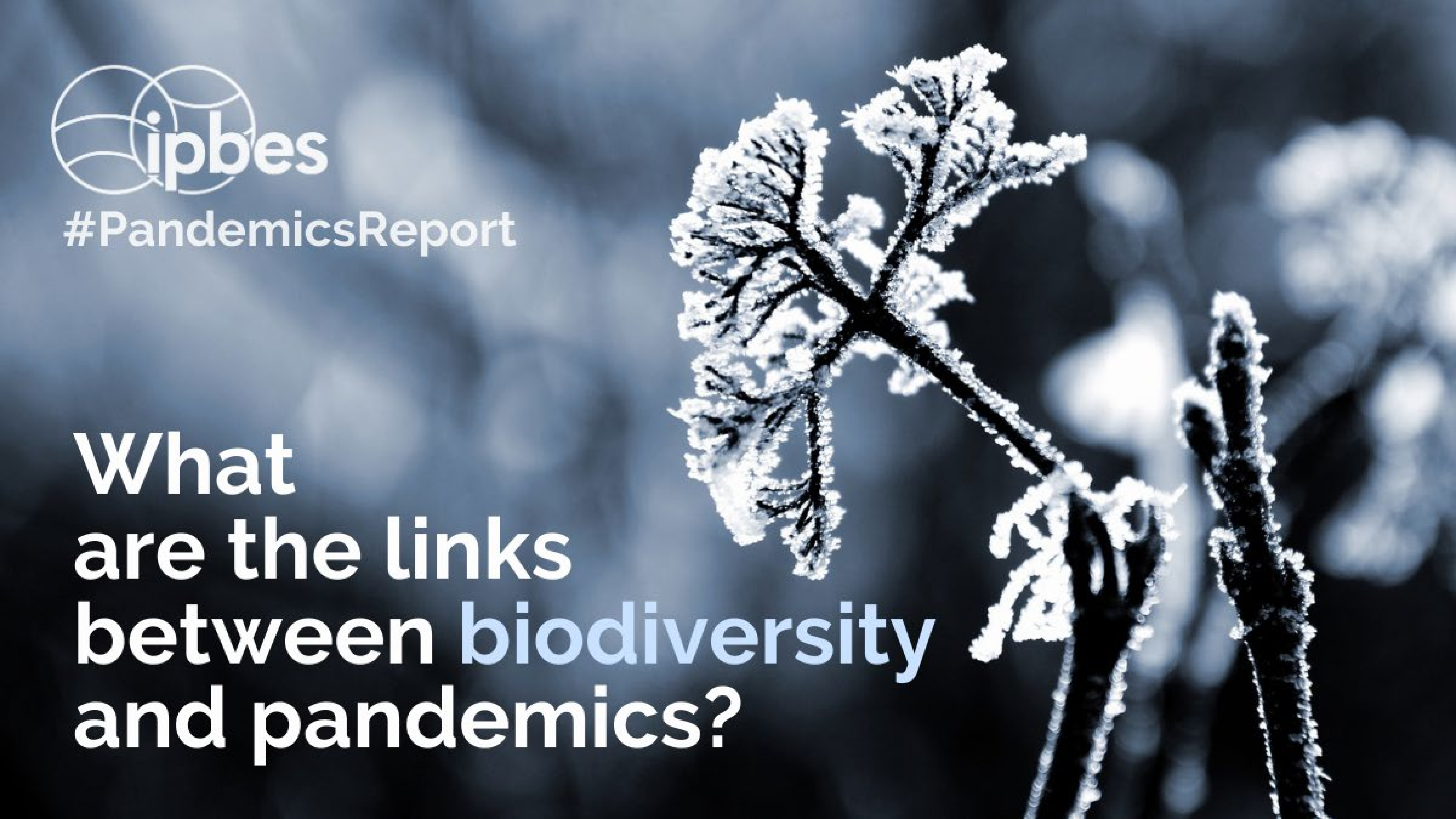
Source: Schäfer, M. S. (2016) Mediated Trust in Science: Concept, Measurement and Perspectives for the 'Science of Science Communication'. Journal of Science Communication 15(05), 1-7, p. 3.

#PandemicsReport

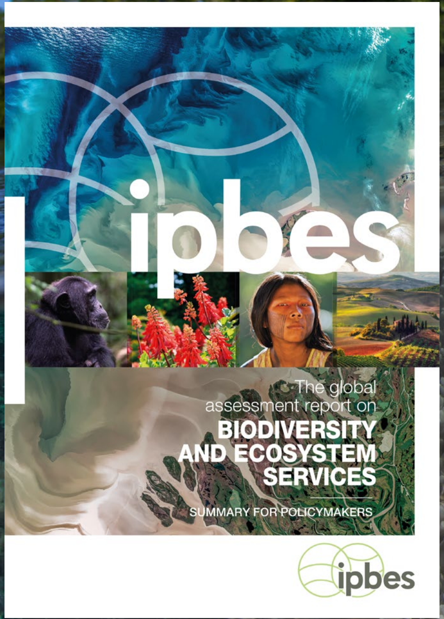


29.10 - 04.11

- 2262 tracked online articles
- Appearing in 1876 different media outlets
- In 110 countries
- In 41 languages
- Generating 'likely' reach of more than 157 million


ipbes
#PandemicsReport
What are the links between biodiversity and pandemics?

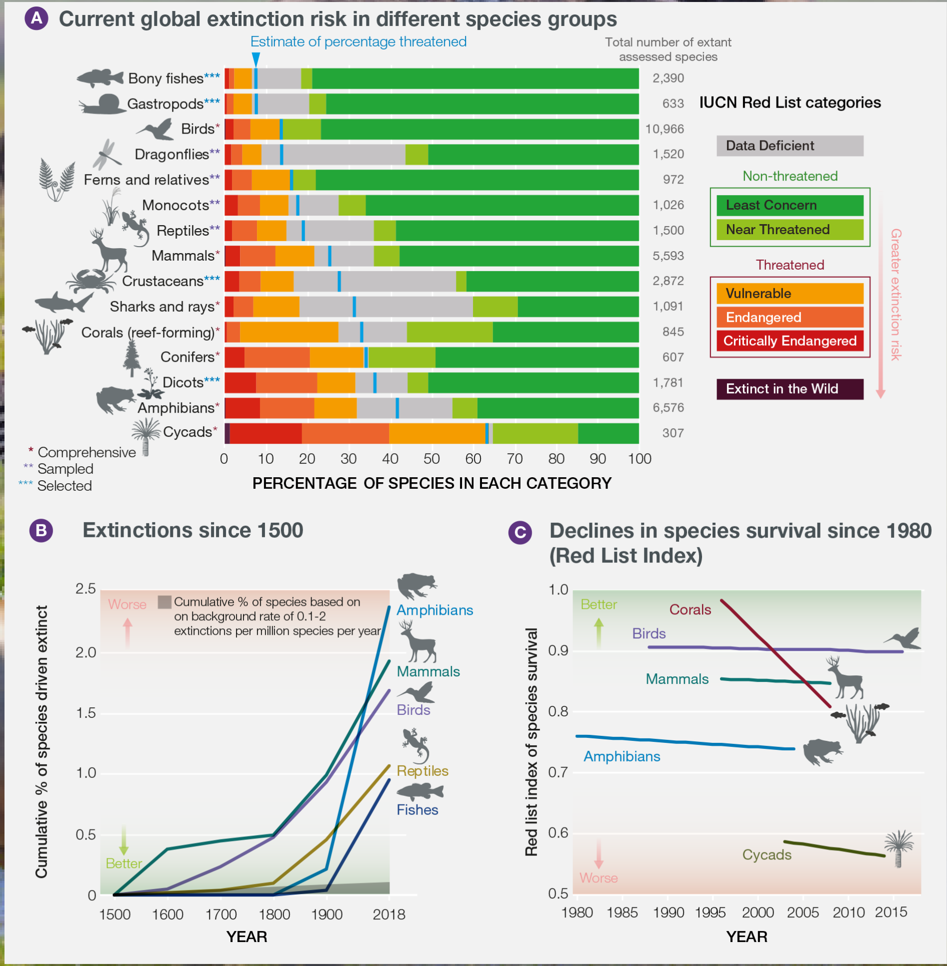
Biodiversity is fundamental to human life on Earth, and it is being destroyed by us at a rate unprecedented in history.

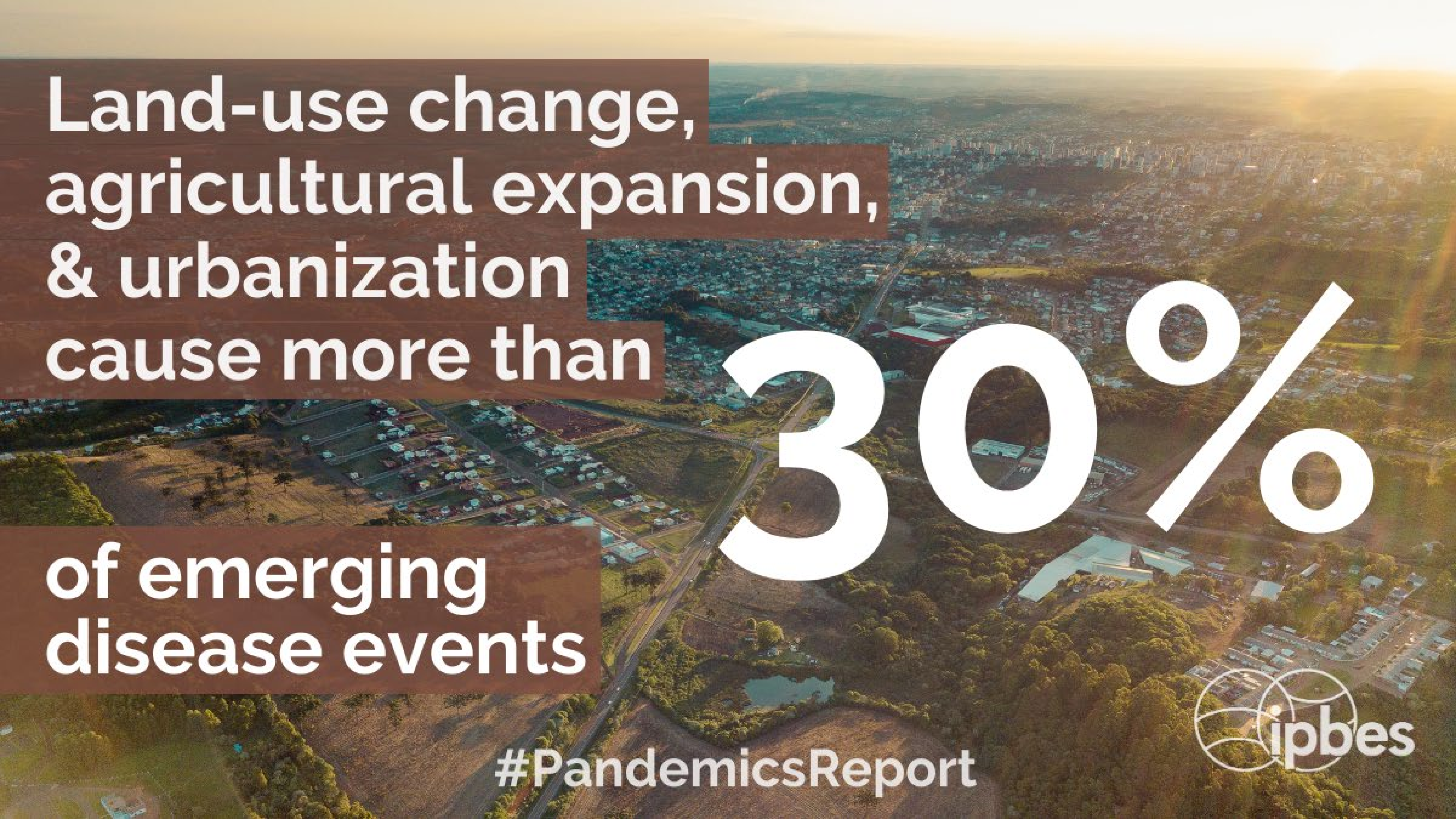


"Many of nature's contributions to people are essential for human health and their decline thus threatens a good quality of life"

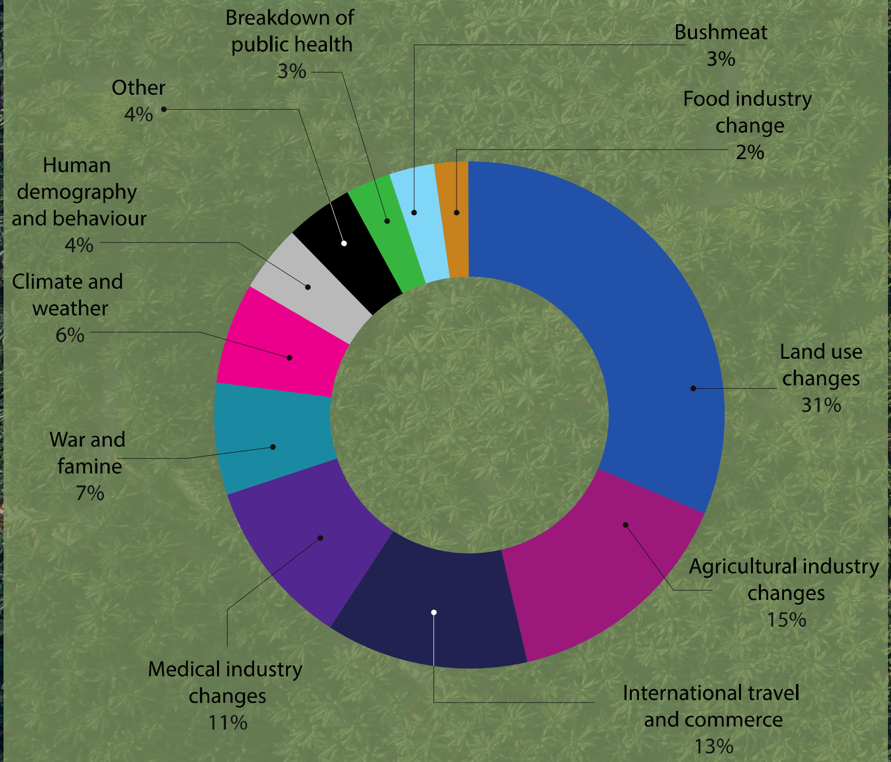
“THE NUMBER OF LOCAL VARIETIES AND BREEDS OF DOMESTICATED PLANTS AND ANIMALS AND THEIR WILD RELATIVES HAS BEEN REDUCED SHARPLY AS A RESULT OF LAND USE CHANGE, KNOWLEDGE LOSS, MARKET PREFERENCES AND LARGE-SCALE TRADE”

IPBES GLOBAL ASSESSMENT




Land-use change,
agricultural expansion,
& urbanization
cause more than
30%
of emerging
disease events
ipbes
#PandemicsReport

Land Use Change Drives Disease Emergence



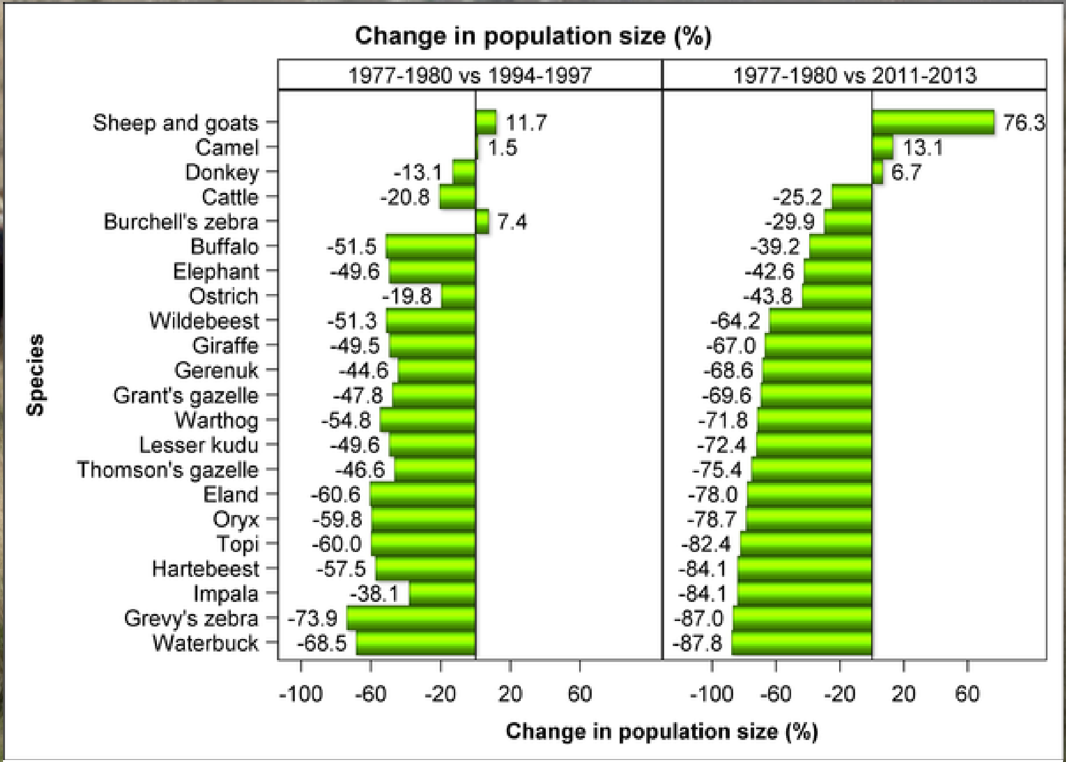
Loh & Zambrana-Torrelio 2015. Vector Bourne Zoonotic Dis

Land use change could lead to disease emergence by:

1) Increasing opportunities for wildlife-human-domestic animal contacts → pathogen spillover from wildlife (to humans or domestic animals) (**pathogen pool hypothesis**)

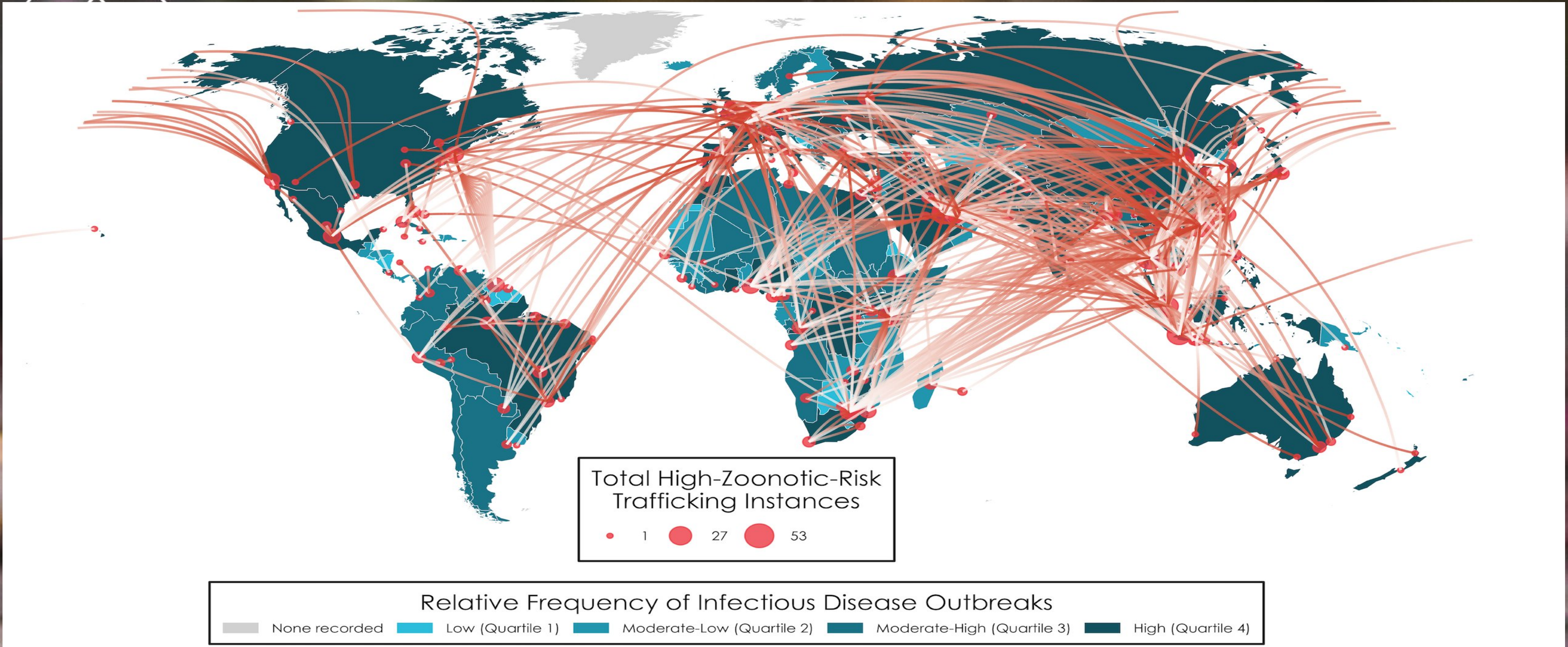
2) Altering host-pathogen ecological dynamics → cross-species transmission (**perturbation hypothesis**)

EXTREME DECLINES IN WILDLIFE AND CONTEMPORANEOUS INCREASE IN LIVESTOCK HAS ALSO AN IMPACT ON EXCHANGE OF PATHOGENS AND ENHANCED RISK FOR EIDs



Ogutu JO, Piepho HP, Said MY, Ojwang GO, Njino LW, et al. (2016) Extreme Wildlife Declines and Concurrent Increase in Livestock Numbers in Kenya: What Are the Causes?. PLOS ONE 11(9): e0163249. https://doi.org/10.1371/journal.pone.0163249


THE WAY WE USE AND RELATE TO WILDLIFE POSES AN ADDITIONAL HIGH RISK FOR DISEASE TRANSMISSION AND THE EMERGENCE OF NEW INFECTIOUS DISEASES
epa



USAID FROM THE AMERICAN PEOPLE

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C4ADS innovation for peace

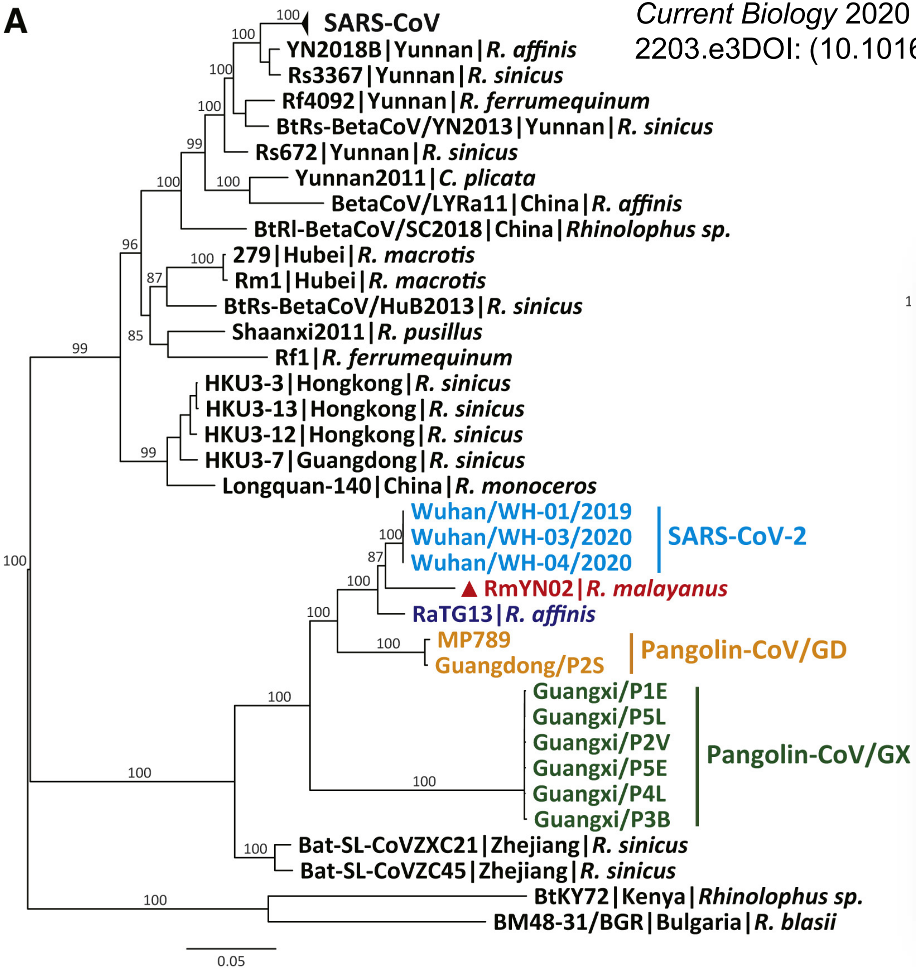
IATA

TRAFFIC the wildlife trade monitoring network

WWF

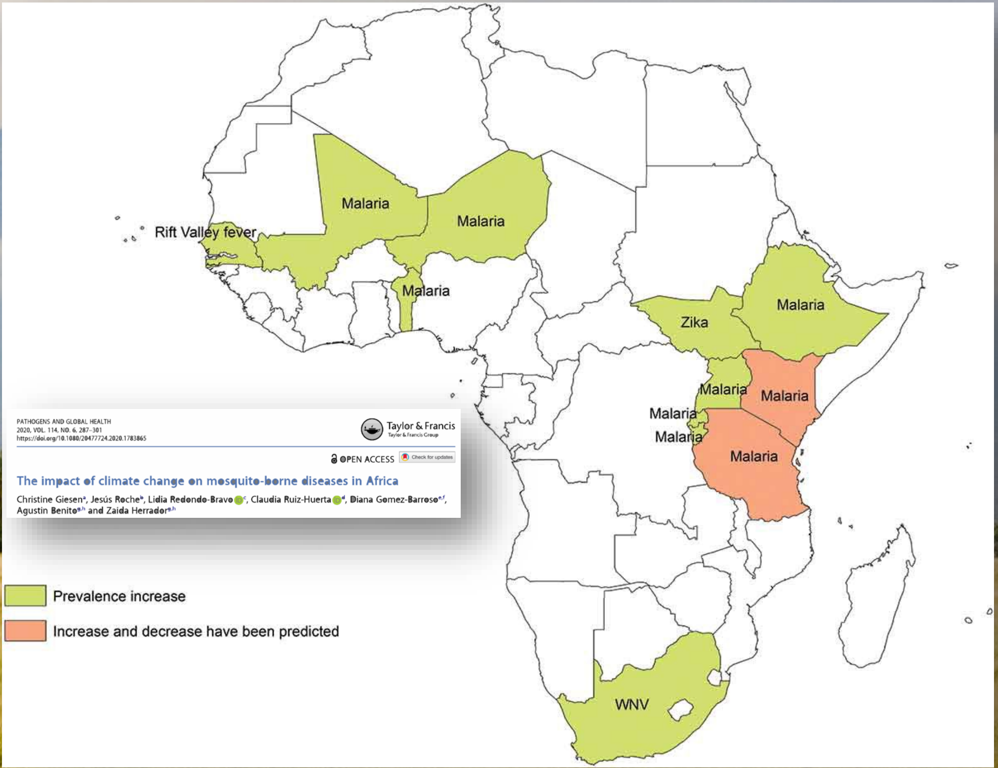
The perceived and direct impacts of wildlife, from being a reservoir of certain human and livestock pathogens and as a risk to health, are frequently overstated when compared to the Global burden of disease statistics available from WHO, OIE and FAO. Kock, R., 2014, Onderstepoort Journal of Veterinary Research 81(2),

Current Biology 2020 302196-2203.e3DOI: (10.1016/j.cub.2020.05.023)



Climate change could drive more than 50% of African bird & mammal species to extinction by 2100. Furthermore it enables the spread of diseases to new species and increases risk for humans

- Yellow fever
- Malaria
- Zika
- Dengue
- RVF
- Chikungunya
- WNV
- Anthrax



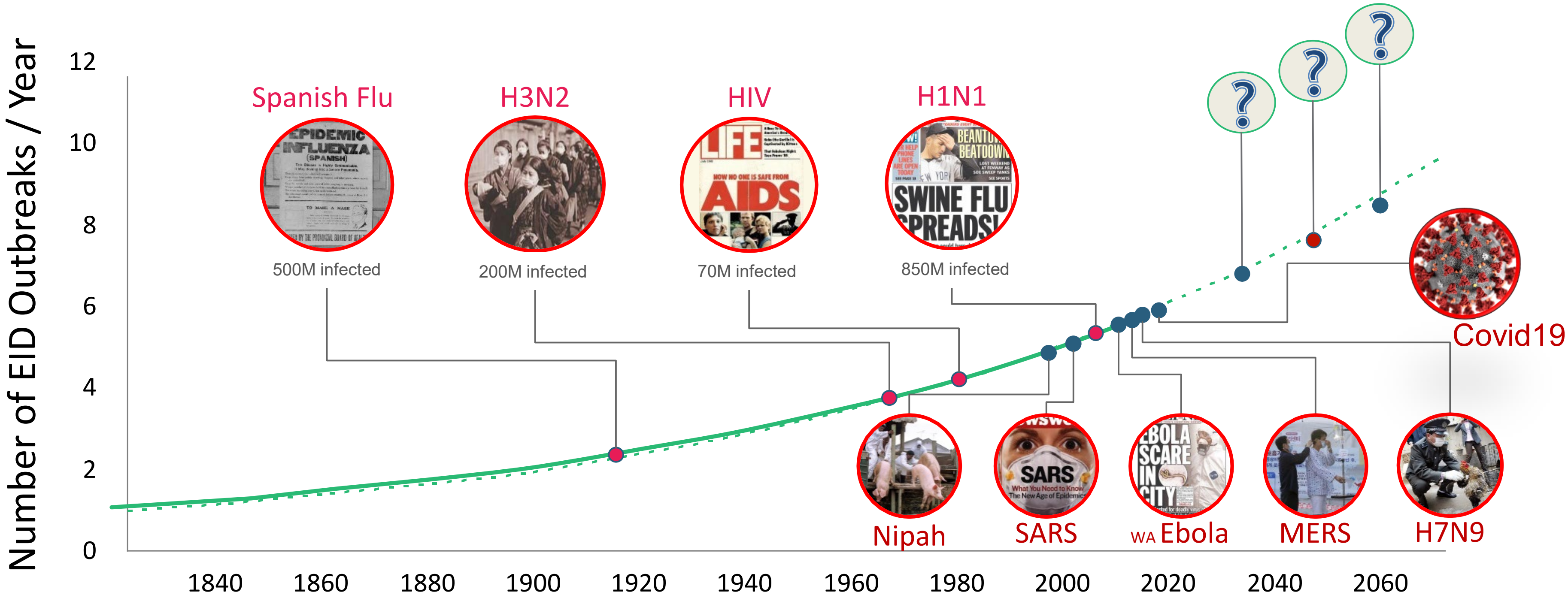
PATHOGENS AND GLOBAL HEALTH
2020, VOL. 114, NO. 6, 287–301
https://doi.org/10.1080/20477724.2020.1783865
Taylor & Francis
Taylor & Francis Group
OPEN ACCESS Check for updates

The impact of climate change on mosquito-borne diseases in Africa

Christine Giesen[a], Jesús Roche[b], Lidia Redondo-Bravo[c], Claudia Ruiz-Huerta[d], Diana Gomez-Barroso[e,f], Agustin Benito[g,h] and Zaida Herrador[g,h]

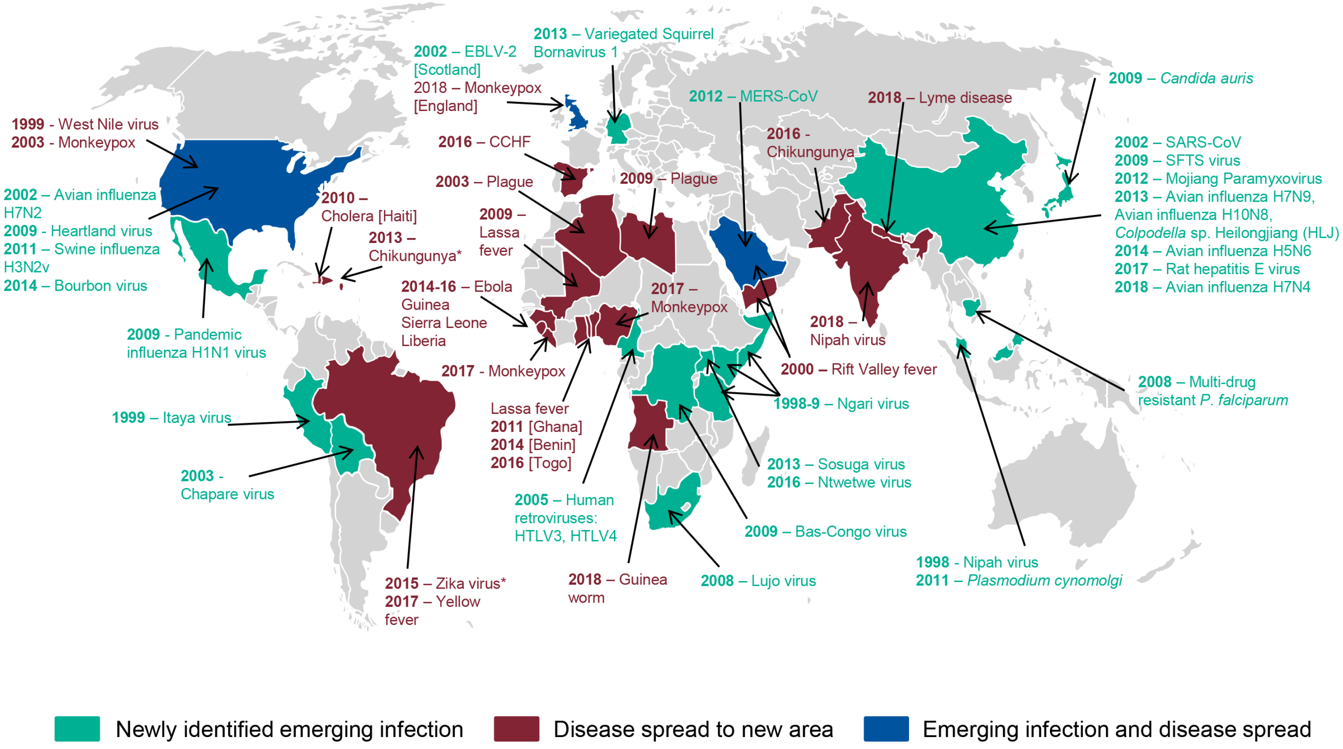

BREAKING
NEWS
PATHOGEN X
Pandemic emerging diseases are a growing threat
Pandemic emerging diseases are a growing threat

Pandemic emerging diseases are a growing threat



Allen et al. (2017) Nature Communications

Global map of significant and new emerging infections in humans: spread to new areas since 1998

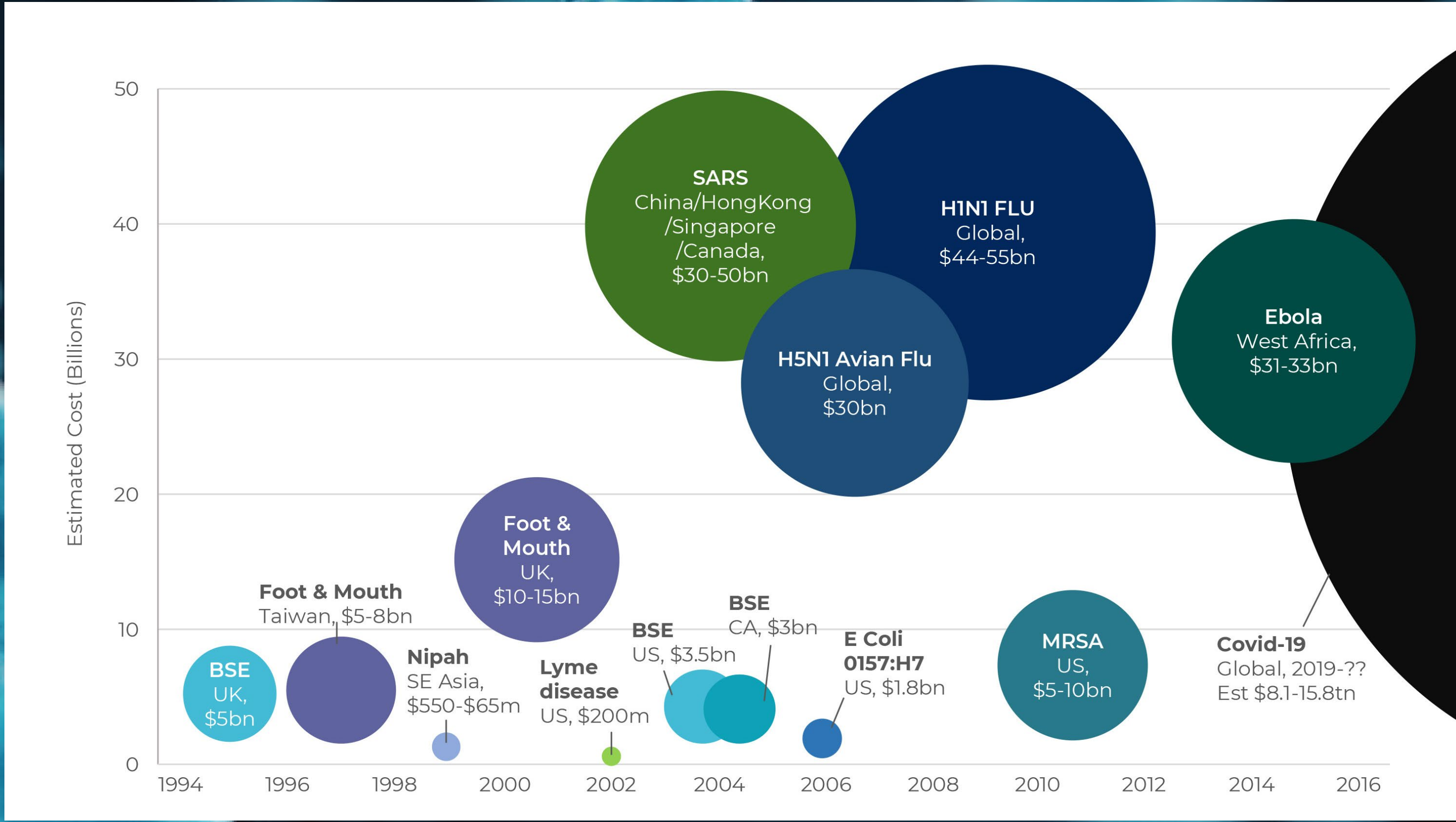


*Incursion followed by regional spread

Pandemics and other emerging zoonoses cause widespread human suffering, and likely more than a trillion dollars in economic damages annually

- **Global strategies to prevent pandemics ~ $22 – 31.2 billion annually – two orders of magnitude less than the damages pandemics produce**

Costs of Pandemics



Costs of Pandemics

POLICY FORUM

ECOLOGY AND ECONOMICS: COVID-19

Ecology and economics for pandemic prevention

Investments to prevent tropical deforestation and to limit wildlife trade will protect against future zoonosis outbreaks

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]

For a century, two new viruses per year have spilled from their natural hosts into humans (*1*). The MERS, SARS, and 2009 H1N1 epidemics, and the HIV and coronavirus disease 2019 (COVID-19) pandemics, testify to their damage. Zoonotic viruses infect people directly most often when they handle live primates, bats, and other wildlife (or their meat) or indirectly from farm animals such as chickens and pigs. The risks are higher than ever (*2*, *3*) as increasingly intimate associations between humans and wildlife disease reservoirs accelerate the potential for viruses to spread globally. Here, we assess the cost of monitoring and preventing disease spillover driven by the unprecedented loss and fragmentation of tropical forests and by the burgeoning wildlife trade. Currently, we invest relatively little toward preventing deforestation and regulating wildlife trade, despite well-researched plans that demonstrate a high return on their investment in limiting zoonoses and conferring many other benefits. As public funding in response to COVID-19 continues to rise, our analysis suggests that the associated costs of these preventive efforts would be substantially less than the economic and mortality costs of responding to these pathogens once they have emerged.

REDUCING DEFORESTATION

Tropical forest edges are a major launchpad for novel human viruses. Edges arise as humans build roads or clear forests for timber production and agriculture. Humans and their livestock are more likely to contact wildlife when more than 25% of the original forest cover is lost (*4*), and such contacts determine the risk of disease transmission. Pathogen transmission depends on the contact rate, the abundance of susceptible humans and livestock, and the abundance of infected wild hosts. Contact rates vary with the perimeter (the length of the forest edge) between forest and nonforest. Deforestation tends to create checkerboards, whereupon we see a maximum perimeter at a 50% level of forest conversion. Thereafter, the abundance of domestic animals and humans rapidly exceeds that of wild animals, so although we expect transmission to decline, the magnitude of any resultant outbreak is higher (*4*). Habitat fragmentation complicates this because it increases the length of the perimeter. Roadbuilding, mining and logging camps, expansion of urban centers and settlements, migration and war, and livestock and crop monocultures have led to increasing virus spillovers. Hunting, transport, farming, and trade of wildlife for food, pets, and traditional medicine compound these routes of transmission and closely track deforestation. For example, bats are the probable reservoirs of Ebola, Nipah, SARS, and the virus behind COVID-19. Fruit bats (Pteropodidae in the Old World, the genus *Artibeus* in the New World) are more likely to feed near human settlements when their forest habitats are disturbed; this has been a key factor in viral emergence in West Africa, Malaysia, Bangladesh, and Australia (*5*–*7*).

The clear link between deforestation and virus emergence suggests that a major effort to retain intact forest cover would have a large return on investment even if its only benefit was to reduce virus emergence events. The largest-scale example of directed deforestation reduction comes from Brazil between 2005 and 2012. Deforestation in the Amazon dropped by 70%, yet production of the region's dominant soy crop still increased (*8*). International contributions, complemented by an Amazon Fund, of about $1 billion supported land-use zoning, market and credit restrictions, and state-of-the-science satellite monitoring. Brazil's program reduced forest fragmentation and edge at a lower cost than could have been achieved by carbon-pricing approaches (*9*).

Several estimates of the effectiveness and cost of strategies to reduce tropical deforestation are available (*8*, *9*). At an annual cost of $9.6 billion, direct forest-protection payments to outcompete deforestation economically could achieve a 40% reduction in areas at highest risk for virus spillover [see supplementary materials (SM)]. Multiple payment-for-ecosystem-services programs demonstrate the effectiveness of this approach. At the low end, widespread adoption of the earlier Brazil policy model could achieve the same reduction for only $1.5 billion annually by removing subsidies that favor deforestation, restricting private land clearing, and supporting territorial rights of indigenous peoples. All require national motivation and political will. Strong public support for similar deforestation-prevention policies may emerge in other countries recovering from COVID-19's devastation.

WILDLIFE TRADE SPILLOVER

Global demand for wildlife causes people to enter forests to collect wildlife for sale in markets in urban and rural areas. In cities, where people have diverse options for protein, bushmeat is a luxury bought to show status, and occasionally for cultural reasons. COVID-19 is the huge price society now pays for such encounters with wild species.

Wildlife markets and the legal and illegal wildlife trade bring live and dead wild animals into contact with hunters, traders, consumers, and all those involved in this commerce. Trade follows global consumer demand. The United States is one of the biggest global importers of wildlife, including for the massive exotic pet industry (*10*). The transit conditions, lack of health screening at import, and warehouses that store animals before and after import are similar to live animal markets, all conducive to spreading diseases.

Some countries have wildlife farming industries intended to prevent overhunting of wild species while meeting market demands for protein and appealing to cultural traditions. In China, wildlife farming is a ~$20 billion industry employing some 15 million people (*11*). With the February 2020 announcement by the Standing Committee of the National People's Congress of a ban on wildlife consumption for food and related trade in China, there are ongoing discussions on phasing out this industry. The justification is that it creates risks for disease emergence and

See supplementary materials for authors' affiliations.
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Published by AAAS

Summary of prevention costs, benefits, and break-even probability change

ITEM	VALUES (2020 $)
Expenditures on preventive measures	
Annual funding for monitoring wildlife trade (CITES+)	$250–$750 M
Annual cost of programs to reduce spillovers	$120–$340 M
Annual cost of programs for early detection and control	$217–$279 M
Annual cost of programs to reduce spillover via livestock	$476–$852 M
Annual cost of reducing deforestation by half	$1.53–$9.59 B
Annual cost of ending wild meat trade in China	$19.4 B
TOTAL GROSS PREVENTION COSTS (*C*)	**$22.0–$31.2 B**
Ancillary benefit of prevention	
Social cost of carbon	$36.5/tonne
Annual CO_2 emissions reduced from 50% less deforestation	118 Mt
Ancillary benefits from reduction in CO_2 emissions	$4.31 B
TOTAL PREVENTION COSTS NET OF CARBON BENEFITS (*C*)	**$17.7–$26.9 B**
Damages from COVID-19	
Lost GDP in world from COVID-19	$5.6 T
Value of a statistical life (*V*) adjusted for COVID-19 mortality structure	$5.34 M or $10.0 M
Total COVID-19 world mortality (Q_D) forecast by 28 July 2020, 50th percentile with 95% error bounds	590,643 [473,209, 1,019,078]
Value of deaths in world from COVID-19 = $Q_D \times V$	
Lowest ($5.34 M × 2.5th percentile mortality forecast)	$2.5 T
Middle ($10 M × 50th percentile mortality forecast)	$5.9 T
Highest ($10 M × 97.5th percentile mortality forecast)	$10.2 T
TOTAL DISEASE DAMAGES (*D*):	
Lowest ($5.34 M × 2.5th percentile mortality forecast)	**$8.1 T**
Middle ($10 M × 50th percentile mortality forecast)	**$11.5 T**
Highest ($10 M × 97.5th percentile mortality forecast)	**$15.8 T**

The break-even change in annual probability of pandemic satisfies $C = \Delta P \times D$, where P_0 = benchmark probability of pandemic; P_1 = probability of pandemic with prevention efforts in place; $\Delta P = P_0 - P_1$; and $\%\Delta P = (\Delta P / P_0) \times 100$.

If $P_0 = 0.01$, C = $30.7 B, and D = $11.5 T (most likely scenario, ignoring ancillary benefits of CO_2 reductions), prevention results in net benefits if it decreases P by 26.7% to $P_1 = 0.00733$. Using other values of C, D, and P results in $\%\Delta P$ ranging from 11.8% to 75.7%; only one scenario has a $\%\Delta P$ exceeding 50%. See supplementary materials.

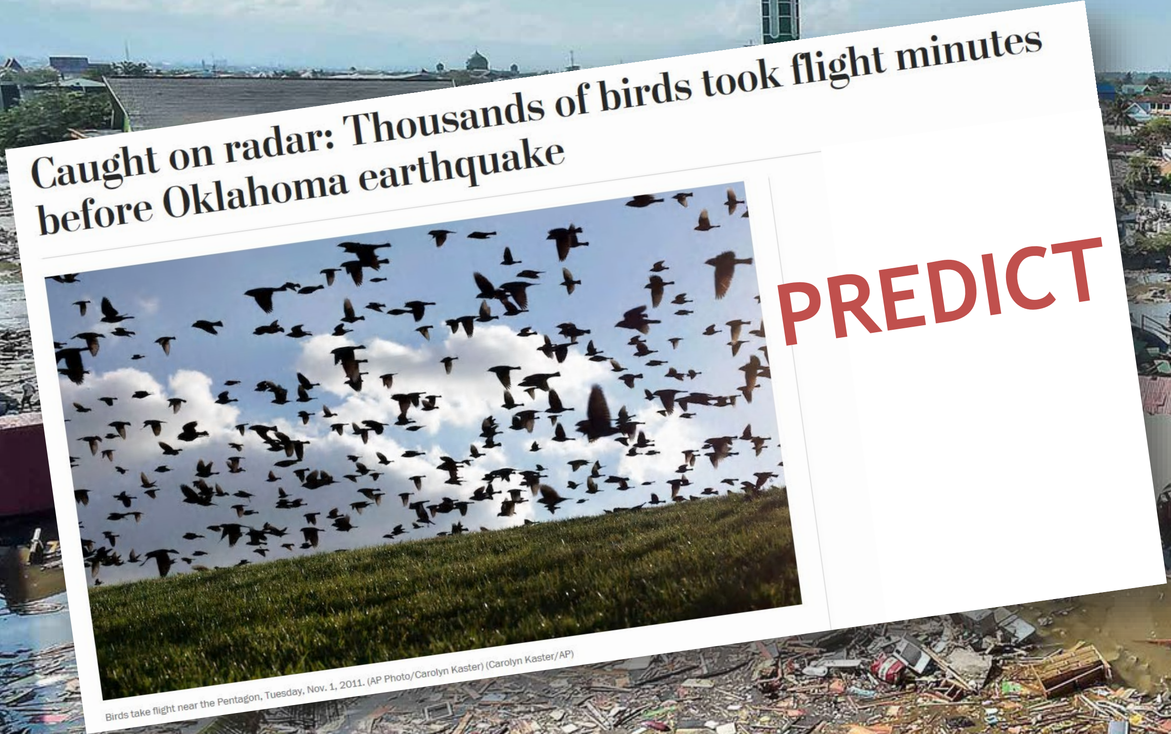
2,2B

19.4B

Investments to prevent deforestation and to limit wildlife trade will protect against future zoonosis outbreaks

16 T

“When animals go crazy, run away from the sea and go to the highlands” *advises a song sung by Indonesian children for centuries.*

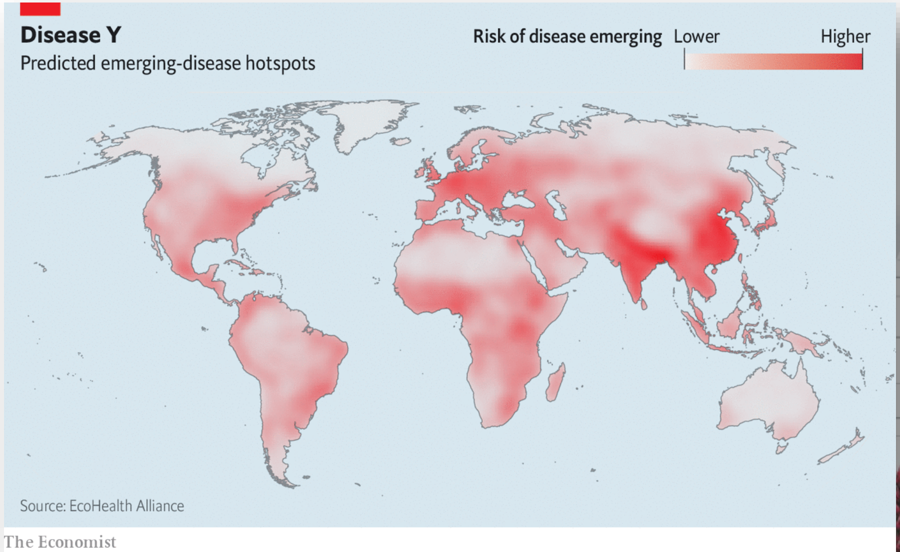

Caught on radar: Thousands of birds took flight minutes before Oklahoma earthquake

Birds take flight near the Pentagon, Tuesday, Nov. 1, 2011. (AP Photo/Carolyn Kaster) (Carolyn Kaster/AP)

PREDICT

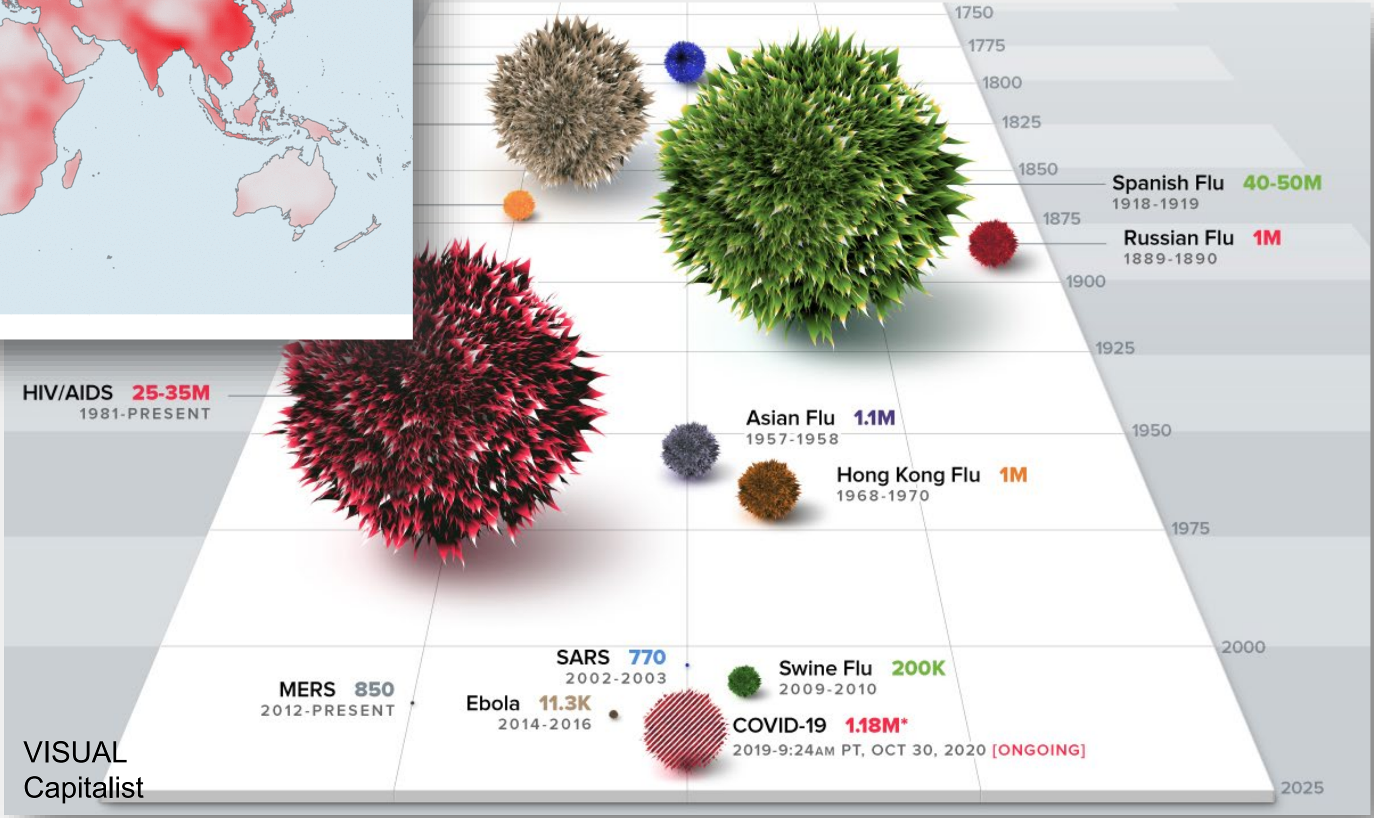
Muhammad Adimaja / Antara Foto Agency / Reuters

THE EARTHQUAKE AT LISBON IN 1755.



PREDICT ???

PREVENT???

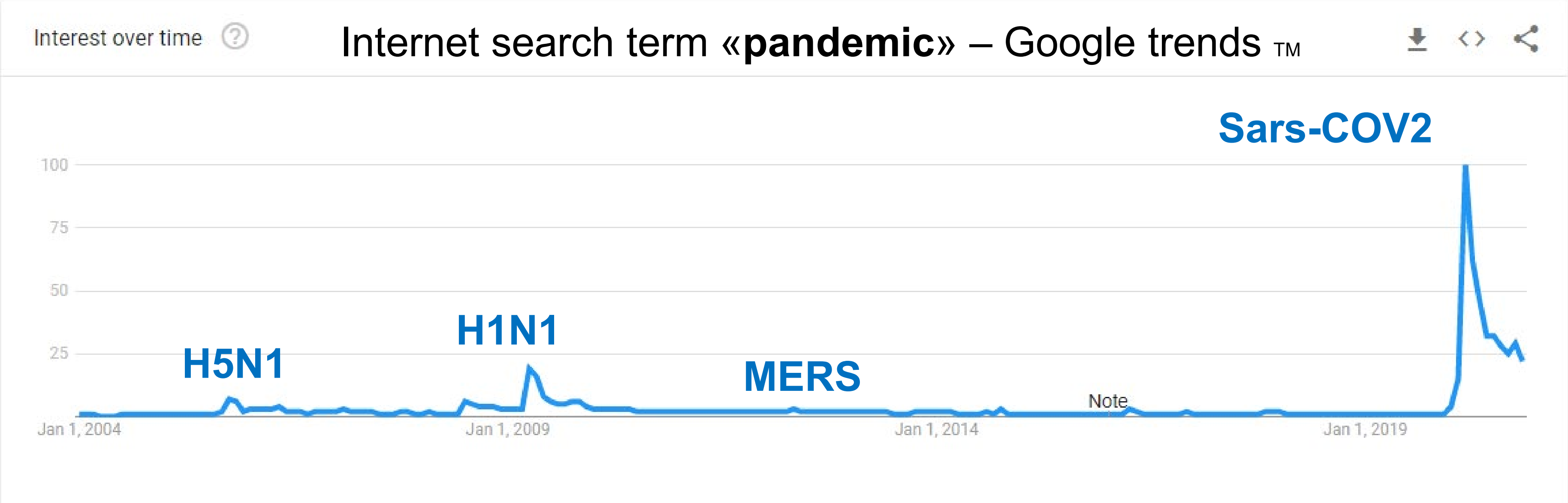


- “that those who come from infested areas shall not enter until after a period of isolation for the purpose of disinfection.”

- “those sick shall hold themselves inside their houses and are not to leave under any circumstances”

- “circulation is to be restricted and regulated”

Lest we …. forget ??



PLOS | ONE

RESEARCH ARTICLE

The Effects of Media Reports on Disease Spread and Important Public Health Measurements

Shannon Collinson[1,2], Kamran Khan[3,4], Jane M. Heffernan[1,2]*

1 Modelling Infection and Immunity Lab, Centre for Disease Modelling, York University, Toronto, Canada, 2 Mathematics & Statistics, York University, Toronto, Canada, 3 Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto, Canada, 4 Department of Medicine, Division of Infectious Diseases, University of Toronto, Toronto, Canada

frontiers in Public Health

ORIGINAL RESEARCH
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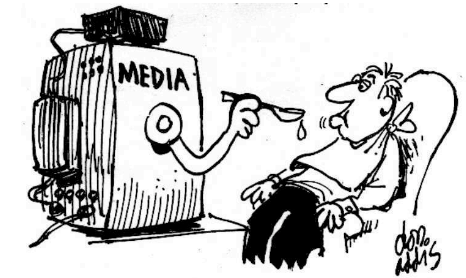
How the Media Places Responsibility for the COVID-19 Pandemic—An Australian Media Analysis

*Trevor Thomas, Annabelle Wilson, Emma Tonkin, Emma R. Miller and Paul R. Ward**



The **POWER**

To inform…
To prioritize…
To influence…
To …….

MAILBOX

All letters and emails must contain a full name, address and telephone number. Only your name and locality will be published, unless otherwise requested. We reserve the right to edit letters. Send them in via e-mail to mailbox@leicestermercury.co.uk
Please note: We are unable to enter into correspondence about why contributions have not been used

Story of horrific battle my father experienced

Saluting everyone affected by wars

Excited about team and quality of its players

Thank you to piper and protegee at Cenotaph

Outbreak on fur farms shows other victims

THE widespread outbreaks of Covid-19 on Danish mink farms is more evidence that the exploitation of animals poses a health threat to humans – not to mention the animal cruelty involved (*"Denmark travel alert"*, November 7).

Once again it is being shown that cramming animals together results in diseases that can be passed on to humans.

Furthermore, these diseases can mutate as has happened in Denmark. It's been reported that a mutation may not respond to the vaccines currently being developed for Covid-19.

Up to 17 million minks will be killed in the hope of halting the spread of the variant strain of the virus. However, these unfortunate animals receive little publicity. Let's hope that when this pandemic is over (if it ever is) all countries will ban cruel fur farming for ever.

Elizabeth Allison, Aylestone

SIGN UP FOR OUR NEWSLETTERS

Sport

Schmeichel to miss Denmark internationals

COVID QUARANTINE MEASURES WOULD FORCE KEEPER OUT OF KEY LEICESTER CITY GAMES

KASPER Schmeichel will not travel to Denmark for their international fixtures as things stand, meaning he won't miss key Leicester City games.

The goalkeeper, who kept a clean sheet in the win over Wolves on Sunday, was due to join up with his country for their Nations League games over the next fortnight, but at the moment will stay at home.

A mutation in Covid-19 that has infected Denmark's mink population has prompted the UK government to place a 14-day quarantine on anybody arriving from the country, a ruling that includes all sportspeople.

If Schmeichel travelled to Denmark for their games, he would then miss City's top-of-the-table clash with Liverpool when Premier League football resumes, as well as games against Braga in the Europa League and Fulham.

The Danish FA, the DBU, have said they are waiting on clarification from the English FA to see if the rules will change.

"The DBU's management has in the last few days been in dialogue with both UEFA, the English Football Association, English authorities and others," the DBU statement read. "As DBU has not received the necessary answers from the English Football Association, national coach Kasper Hjulmand has been forced to select a number of extra players for the test match against Sweden on Wednesday, if the English authorities do not have time to change the rules in the next few days."

After the win over Wolves, City manager Brendan Rodgers confirmed that as things stand, Schmeichel will not be heading abroad.

But the goalkeeper himself hopes to play, and believes the restrictions are "political", rather than dictated by science.

"I mean it is obviously politics, I don't think it has a lot to do with science," Schmeichel told Sky Sports.

"The politics of it is the government has made a decision for now.

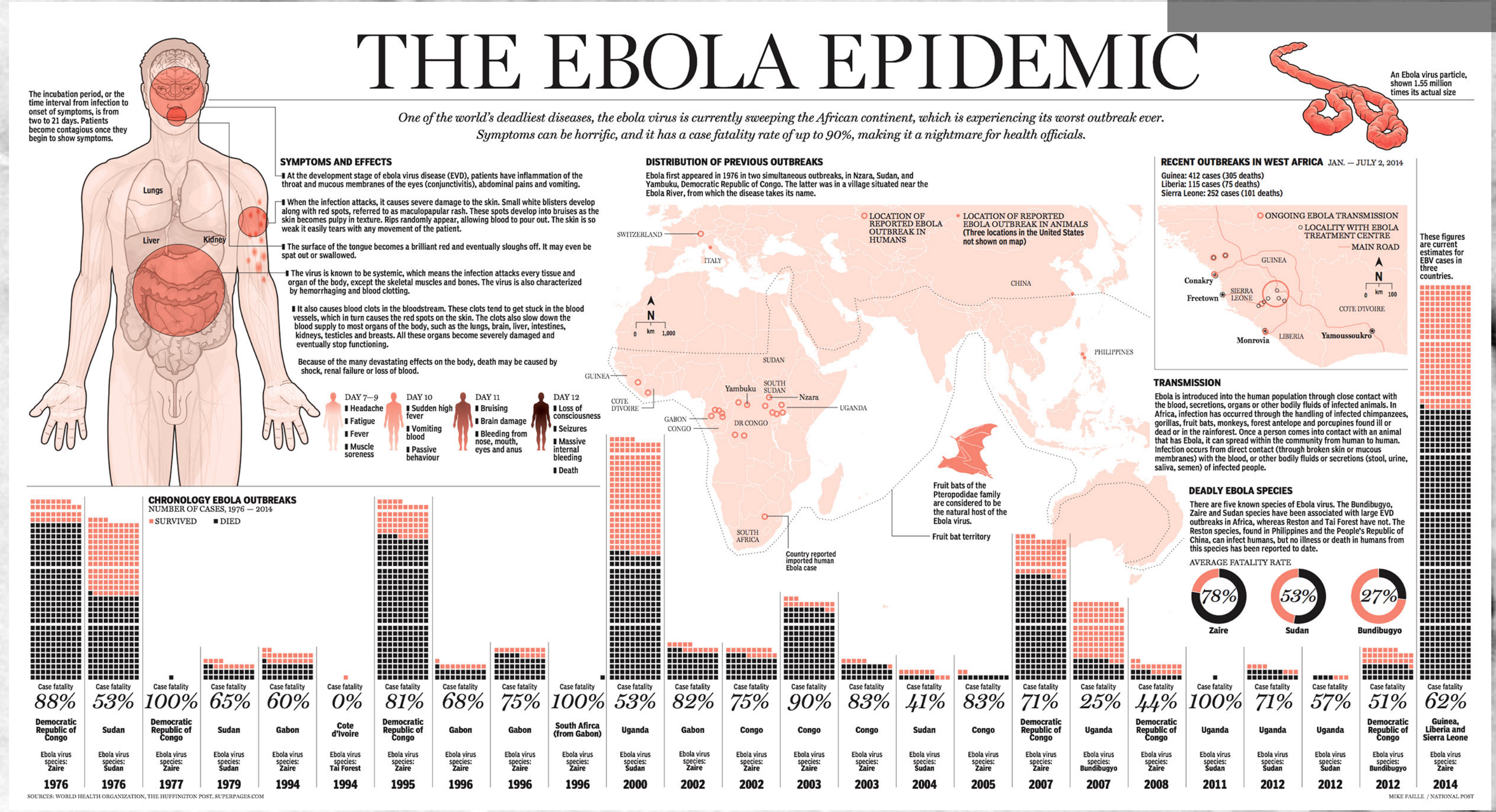
"I hope they come to their senses and see we are very protected and in a bubble.

"We get tested all the time and I hope to be able to participate in at least one, if not two, of the games."

DISAPPOINTED: Kasper Schmeichel is hoping he can still travel to Denmark to play for his country

England legend Shearer impressed with City's title credentials

EBOLA



THE EBOLA EPIDEMIC
One of the world's deadliest diseases, the ebola virus is currently sweeping the African continent, which is experiencing its worst outbreak ever.
Symptoms can be horrific, and it has a case fatality rate of up to 90%, making it a nightmare for health officials.
An Ebola virus particle, shown 1.55 million times its actual size
The incubation period, or the time interval from infection to onset of symptoms, is from two to 21 days. Patients become contagious once they begin to show symptoms.
Lungs
Liver
Kidney
SYMPTOMS AND EFFECTS
At the development stage of ebola virus disease (EVD), patients have inflammation of the throat and mucous membranes of the eyes (conjunctivitis), abdominal pains and vomiting.
When the infection attacks, it causes severe damage to the skin. Small white blisters develop along with red spots, referred to as maculopapular rash. These spots develop into bruises as the skin becomes pulpy in texture. Rips randomly appear, allowing blood to pour out. The skin is so weak it easily tears with any movement of the patient.
The surface of the tongue becomes a brilliant red and eventually sloughs off. It may even be spat out or swallowed.
The virus is known to be systemic, which means the infection attacks every tissue and organ of the body, except the skeletal muscles and bones. The virus is also characterized by hemorrhaging and blood clotting.
It also causes blood clots in the bloodstream. These clots tend to get stuck in the blood vessels, which in turn causes the red spots on the skin. The clots also slow down the blood supply to most organs of the body, such as the lungs, brain, liver, intestines, kidneys, testicles and breasts. All these organs become severely damaged and eventually stop functioning.
Because of the many devastating effects on the body, death may be caused by shock, renal failure or loss of blood.
DAY 7—9: Headache, Fatigue, Fever, Muscle soreness
DAY 10: Sudden high fever, Vomiting blood, Passive behaviour
DAY 11: Bruising, Brain damage, Bleeding from nose, mouth, eyes and anus
DAY 12: Loss of consciousness, Seizures, Massive internal bleeding, Death
DISTRIBUTION OF PREVIOUS OUTBREAKS
Ebola first appeared in 1976 in two simultaneous outbreaks, in Nzara, Sudan, and Yambuku, Democratic Republic of Congo. The latter was in a village situated near the Ebola River, from which the disease takes its name.
LOCATION OF REPORTED EBOLA OUTBREAK IN HUMANS
LOCATION OF REPORTED EBOLA OUTBREAK IN ANIMALS (Three locations in the United States not shown on map)
SWITZERLAND
ITALY
CHINA
PHILIPPINES
N
0 km 1,000
SUDAN
SOUTH SUDAN
Yambuku
Nzara
UGANDA
GUINEA
COTE D'IVOIRE
GABON
CONGO
DR CONGO
SOUTH AFRICA
Country reported imported human Ebola case
Fruit bats of the Pteropodidae family are considered to be the natural host of the Ebola virus.
Fruit bat territory
RECENT OUTBREAKS IN WEST AFRICA JAN. — JULY 2, 2014
Guinea: 412 cases (305 deaths)
Liberia: 115 cases (75 deaths)
Sierra Leone: 252 cases (101 deaths)
ONGOING EBOLA TRANSMISSION
LOCALITY WITH EBOLA TREATMENT CENTRE
MAIN ROAD
GUINEA
Conakry
Freetown
SIERRA LEONE
N
0 km 100
COTE D'IVOIRE
Monrovia
LIBERIA
Yamoussoukro
These figures are current estimates for EBV cases in three countries.
TRANSMISSION
Ebola is introduced into the human population through close contact with the blood, secretions, organs or other bodily fluids of infected animals. In Africa, infection has occurred through the handling of infected chimpanzees, gorillas, fruit bats, monkeys, forest antelope and porcupines found ill or dead or in the rainforest. Once a person comes into contact with an animal that has Ebola, it can spread within the community from human to human. Infection occurs from direct contact (through broken skin or mucous membranes) with the blood, or other bodily fluids or secretions (stool, urine, saliva, semen) of infected people.
DEADLY EBOLA SPECIES
There are five known species of Ebola virus. The Bundibugyo, Zaire and Sudan species have been associated with large EVD outbreaks in Africa, whereas Reston and Tai Forest have not. The Reston species, found in Philippines and the People's Republic of China, can infect humans, but no illness or death in humans from this species has been reported to date.
AVERAGE FATALITY RATE
78% Zaire
53% Sudan
27% Bundibugyo
CHRONOLOGY EBOLA OUTBREAKS
NUMBER OF CASES, 1976 — 2014
SURVIVED
DIED
Case fatality 88% Democratic Republic of Congo Ebola virus species: Zaire 1976
Case fatality 53% Sudan Ebola virus species: Sudan 1976
Case fatality 100% Democratic Republic of Congo Ebola virus species: Zaire 1977
Case fatality 65% Sudan Ebola virus species: Sudan 1979
Case fatality 60% Gabon Ebola virus species: Zaire 1994
Case fatality 0% Cote d'Ivoire Ebola virus species: Tai Forest 1994
Case fatality 81% Democratic Republic of Congo Ebola virus species: Zaire 1995
Case fatality 68% Gabon Ebola virus species: Zaire 1996
Case fatality 75% Gabon Ebola virus species: Zaire 1996
Case fatality 100% South Africa (from Gabon) Ebola virus species: Zaire 1996
Case fatality 53% Uganda Ebola virus species: Sudan 2000
Case fatality 82% Gabon Ebola virus species: Zaire 2002
Case fatality 75% Congo Ebola virus species: Zaire 2002
Case fatality 90% Congo Ebola virus species: Zaire 2003
Case fatality 83% Congo Ebola virus species: Zaire 2003
Case fatality 41% Sudan Ebola virus species: Sudan 2004
Case fatality 83% Congo Ebola virus species: Zaire 2005
Case fatality 71% Democratic Republic of Congo Ebola virus species: Zaire 2007
Case fatality 25% Uganda Ebola virus species: Bundibugyo 2007
Case fatality 44% Democratic Republic of Congo Ebola virus species: Zaire 2008
Case fatality 100% Uganda Ebola virus species: Sudan 2011
Case fatality 71% Uganda Ebola virus species: Sudan 2012
Case fatality 57% Uganda Ebola virus species: Sudan 2012
Case fatality 51% Democratic Republic of Congo Ebola virus species: Bundibugyo 2012
Case fatality 62% Guinea, Liberia and Sierra Leone Ebola virus species: Zaire 2014
SOURCES: WORLD HEALTH ORGANIZATION, THE HUFFINGTON POST, SUPERPAGES.COM
MIKE FAILLE / NATIONAL POST


In Africa human Ebola infections have been associated with hunting, butchering, and processing meat from infected animals.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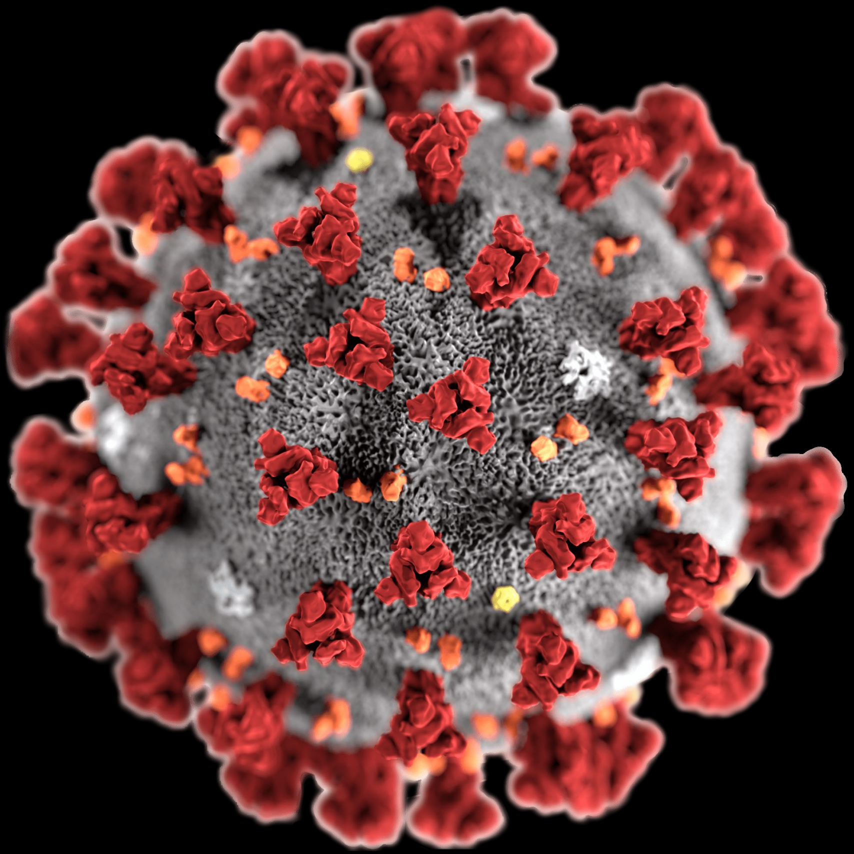
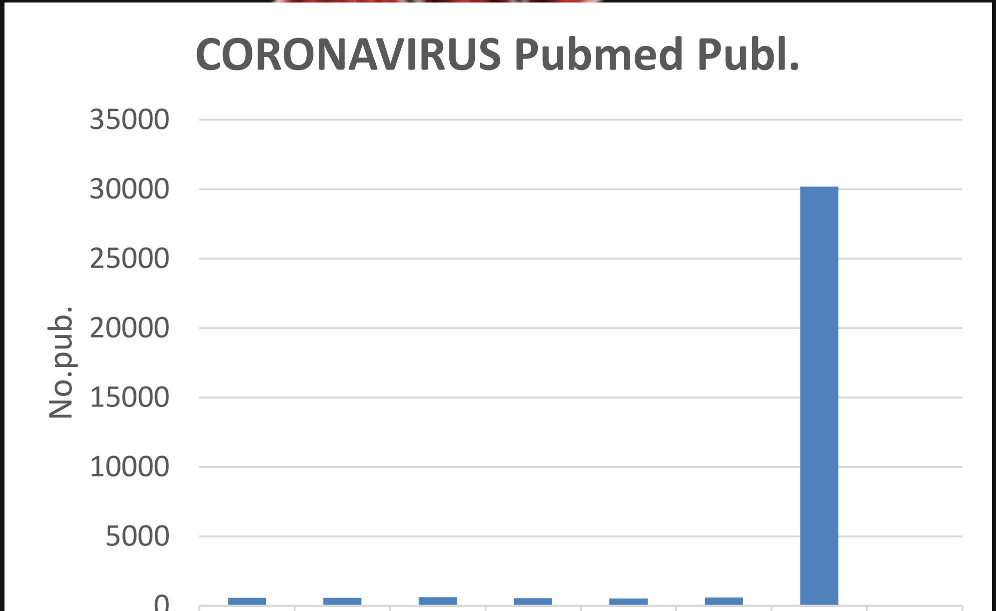


What about... Sars-CoV 2 ?



	2014	2015	2016	2017	2018	2019	2020
Pubs	589	590	625	562	533	593	30184

BRIEF REPORT

A Novel Coronavirus from Patients with Pneumonia in China, 2019

Na Zhu, Ph.D., Dingyu Zhang, M.D., Wenling Wang, Ph.D., Xingwang Li, M.D., Bo Yang, M.S., Jingdong Song, Ph.D., Xiang Zhao, Ph.D., Baoying Huang, Ph.D., Weifeng Shi, Ph.D., Roujian Lu, M.D., Peihua Niu, Ph.D., Faxian Zhan, Ph.D., Xuejun Ma, Ph.D., Dayan Wang, Ph.D., Wenbo Xu, M.D., Guizhen Wu, M.D., George F. Gao, D.Phil., and Wenjie Tan, M.D., Ph.D., for the China Novel Coronavirus Investigating and Research Team

SUMMARY

In December 2019, a cluster of patients with pneumonia of unknown cause was linked to a seafood wholesale market in Wuhan, China. A previously unknown betacoronavirus was discovered through the use of unbiased sequencing in samples from patients with pneumonia. Human airway epithelial cells were used to isolate a novel coronavirus, named 2019-nCoV, which formed a clade within the subgenus sarbecovirus, Orthocoronavirinae subfamily. Different from both MERS-CoV and SARS-CoV, 2019-nCoV is the seventh member of the family of coronaviruses that infect humans. Enhanced surveillance and further investigation are ongoing. (Funded by the National Key Research and Development Program of China and the National Major Project for Control and Prevention of Infectious Disease in China.)

EMERGING AND REEMERGING PATHOGENS ARE GLOBAL CHALLENGES FOR public health.[1] Coronaviruses are enveloped RNA viruses that are distributed broadly among humans, other mammals, and birds and that cause respiratory, enteric, hepatic, and neurologic diseases.[2,3] Six coronavirus species are known to cause human disease.[4] Four viruses — 229E, OC43, NL63, and HKU1 — are prevalent and typically cause common cold symptoms in immunocompetent individuals.[4] The two other strains — severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) — are zoonotic in origin and have been linked to sometimes fatal illness.[5] SARS-CoV was the causal agent of the severe acute respiratory syndrome outbreaks in 2002 and 2003 in Guangdong Province, China.[6-8] MERS-CoV was the pathogen responsible for severe respiratory disease outbreaks in 2012 in the Middle East.[9] Given the high prevalence and wide distribution of coronaviruses, the large genetic diversity and frequent recombination of their genomes, and increasing human–animal interface activities, novel coronaviruses are likely to emerge periodically in humans owing to frequent cross-species infections and occasional spillover events.[5,10]

In late December 2019, several local health facilities reported clusters of patients with pneumonia of unknown cause that were epidemiologically linked to a seafood and wet animal wholesale market in Wuhan, Hubei Province, China.[11] On December 31, 2019, the Chinese Center for Disease Control and Prevention (China CDC) dispatched a rapid response team to accompany Hubei provincial and Wuhan city health authorities and to conduct an epidemiologic and etiologic investigation. We report the results of this investigation, identifying the source of the pneumonia

From the NHC Key Laboratory of Biosafety, National Institute for Viral Disease Control and Prevention, Chinese Center for Disease Control and Prevention (N.Z., W.W., J.S., X.Z., B.H., R.L., P.N., X.M., D.W., W.X., G.W., G.F.G., W.T.), and the Department of Infectious Diseases, Beijing Ditan Hospital, Capital Medical University (X.L.) — both in Beijing; Wuhan Jinyintan Hospital (D.Z.), the Division for Viral Disease Detection, Hubei Provincial Center for Disease Control and Prevention (B.Y., F.Z.), and the Center for Biosafety Mega-Science, Chinese Academy of Sciences (W.T.) — all in Wuhan; and the Shandong First Medical University and Shandong Academy of Medical Sciences, Jinan, China (W.S.). Address reprint requests to Dr. Tan at the NHC Key Laboratory of Biosafety, National Institute for Viral Disease Control and Prevention, China CDC, 155 Changbai Road, Changping District, Beijing 102206, China; or at tanwj@ivdc.chinacdc.cn, Dr. Gao at the National Institute for Viral Disease Control and Prevention, China CDC, Beijing 102206, China, or at gaof@im.ac.cn, or Dr. Wu at the NHC Key Laboratory of Biosafety, National Institute for Viral Disease Control and Prevention, China CDC, Beijing 102206, China, or at wugz@ivdc.chinacdc.cn.

Drs. Zhu, Zhang, W. Wang, Li, and Yang contributed equally to this article.

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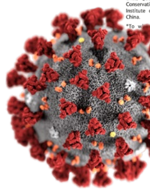
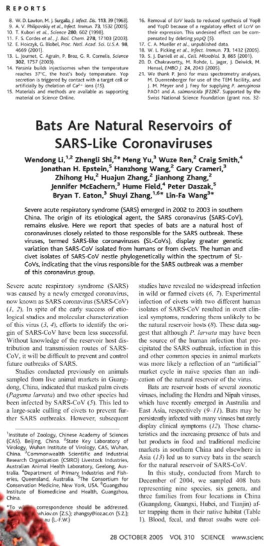


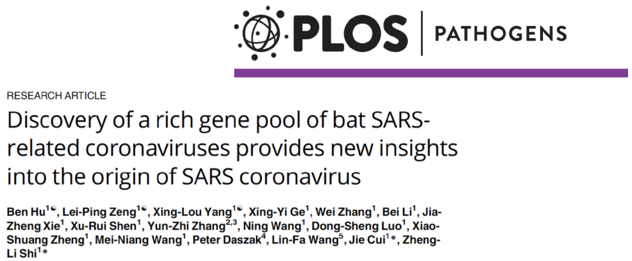


REPORTS

Bats Are Natural Reservoirs of SARS-Like Coronaviruses

Wendong Li, Zhengli Shi, Meng Yu, Wuze Ren, Craig Smith, Jonathan H. Epstein, Hanzhong Wang, Gary Crameri, Zhihong Hu, Huajun Zhang, Jianhong Zhang, Jennifer McEachern, Hume Field, Peter Daszak, Bryan T. Eaton, Shuyi Zhang, Lin-Fa Wang

28 OCTOBER 2005 VOL 310 SCIENCE



PLOS PATHOGENS

RESEARCH ARTICLE

Discovery of a rich gene pool of bat SARS-related coronaviruses provides new insights into the origin of SARS coronavirus

Ben Hu, Lei-Ping Zeng, Xing-Lou Yang, Xing-Yi Ge, Wei Zhang, Bei Li, Jia-Zheng Xie, Xu-Rui Shen, Yun-Zhi Zhang, Ning Wang, Dong-Sheng Luo, Xiao-Shuang Zheng, Mei-Niang Wang, Peter Daszak, Lin-Fa Wang, Jie Cui, Zheng-Li Shi

LETTER

doi:10.1038/nature12711

Isolation and characterization of a bat SARS-like coronavirus that uses the ACE2 receptor

Xing-Yi Ge, Jia-Lu Li, Xing-Lou Yang, Aleksei A. Chmura, Guangjian Zhu, Jonathan H. Epstein, Jonna K. Mazet, Ben Hu, Wei Zhang, Cheng Peng, Yu-Ji Zhang, Chu-Ming Luo, Bing Tan, Ning Wang, Yan Zhu, Gary Crameri, Shu-Yi Zhang, Lin-Fa Wang, Peter Daszak & Zheng-Li Shi

28 NOVEMBER 2013 | VOL 503 | NATURE

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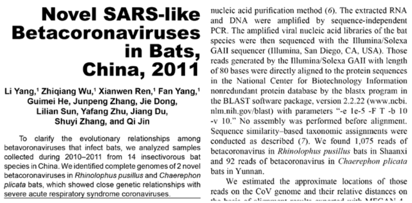

Novel SARS-like Betacoronaviruses in Bats, China, 2011

Li Yang, Zhiqiang Wu, Xianwen Ren, Fan Yang, Guimei He, Junpeng Zhang, Jie Dong, Lilian Sun, Yafang Zhu, Jiang Du, Shuyi Zhang, and Qi Jin

ARE YOU LISTENING

Prediction and Prevention is BETTER than cure

What can governments do to prevent future pandemics?

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#PandemicsReport

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Governments could establish an intergovernmental council on pandemic prevention to help escape the 'era of pandemics'

- **Building a new intergovernmental health and trade partnership to reduce zoonotic disease risks in the international wildlife trade, building on collaborations among international organisations.**

- **Institutionalizing the ‘One Health’ approach in national governments to build pandemic preparedness, enhance pandemic prevention programs, and to investigate and control outbreaks across sectors.**

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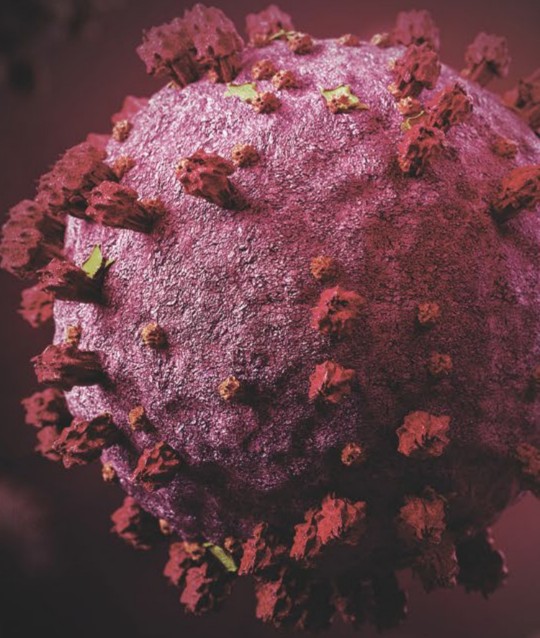

Prediction and Prevention is **better** than cure and it starts with... me and you!

- **Enabling transformative change to reduce the types of consumption, globalized agricultural expansion and trade that have led to pandemics**
- **Educating communities from all sectors in emerging infectious diseases hotspots**
- **Making better use of indigenous knowledge**
- **Incorporate pandemic risk into planning**
- **Supporting One Health scientific research to design and test better strategies to prevent pandemics**


PREDICTION AND PREVENTION HAVE A VALUE
THAT CANNOT BE QUANTIFIED IN DOLLARS


PREDICTION AND PREVENTION HAVE A VALUE THAT CANNOT BE QUANTIFIED IN DOLLARS
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WE NEED
YOUR HELP
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Business-as-usual approach does not work. The time to change is … NOW.
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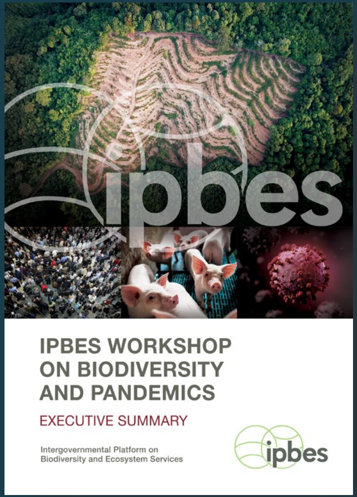

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Thank you for your attention!

Terima kasih!

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