



# One Health and Agri-Food Systems

Human, animal and environmental health in  
Africa and Asia

John McDermott

Director – Agriculture for Nutrition and Health

CGIAR / International Food Policy Research Institute (IFPRI)

# What is One Health?

## The One Health Triad



Infectious disease focus

- pathogens (shared)
- hosts (people, animals, and others)
- environment (micro to macro)

Latest framing in long history

- Landscape epidemiology
- Natural History of Infections
- Infections
- One Medicine

# Why is One Health increasingly prominent?

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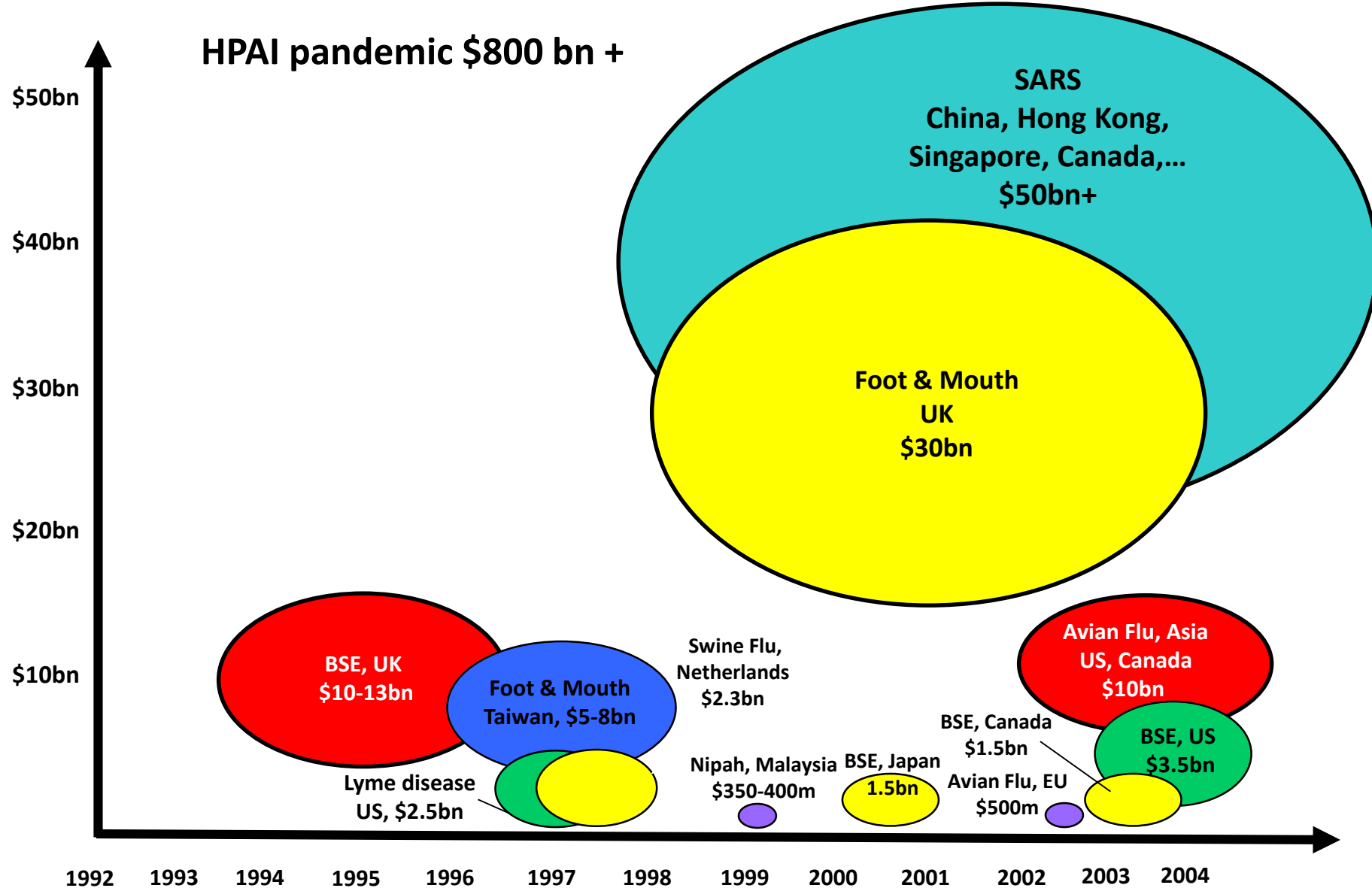
Agri-food elements are critical  
to human health

**Emerging  
Zoonoses**  
75% of  
diseases  
with epidemic  
and pandemic  
potential

**Food Safety:**  
burden of  
disease  
comparable to  
malaria, HIV,  
TB

**Antimicrobial  
resistance** is  
a big concern:  
largest  
quantities for  
animals

# Economic Impact of Selected Diseases



Source: Bio-Era. Courtesy of Dr. Will Hueston, Center for Animal Health and Food Safety, UM

**TABLE 1** Important examples of recent epidemic zoonoses not previously known

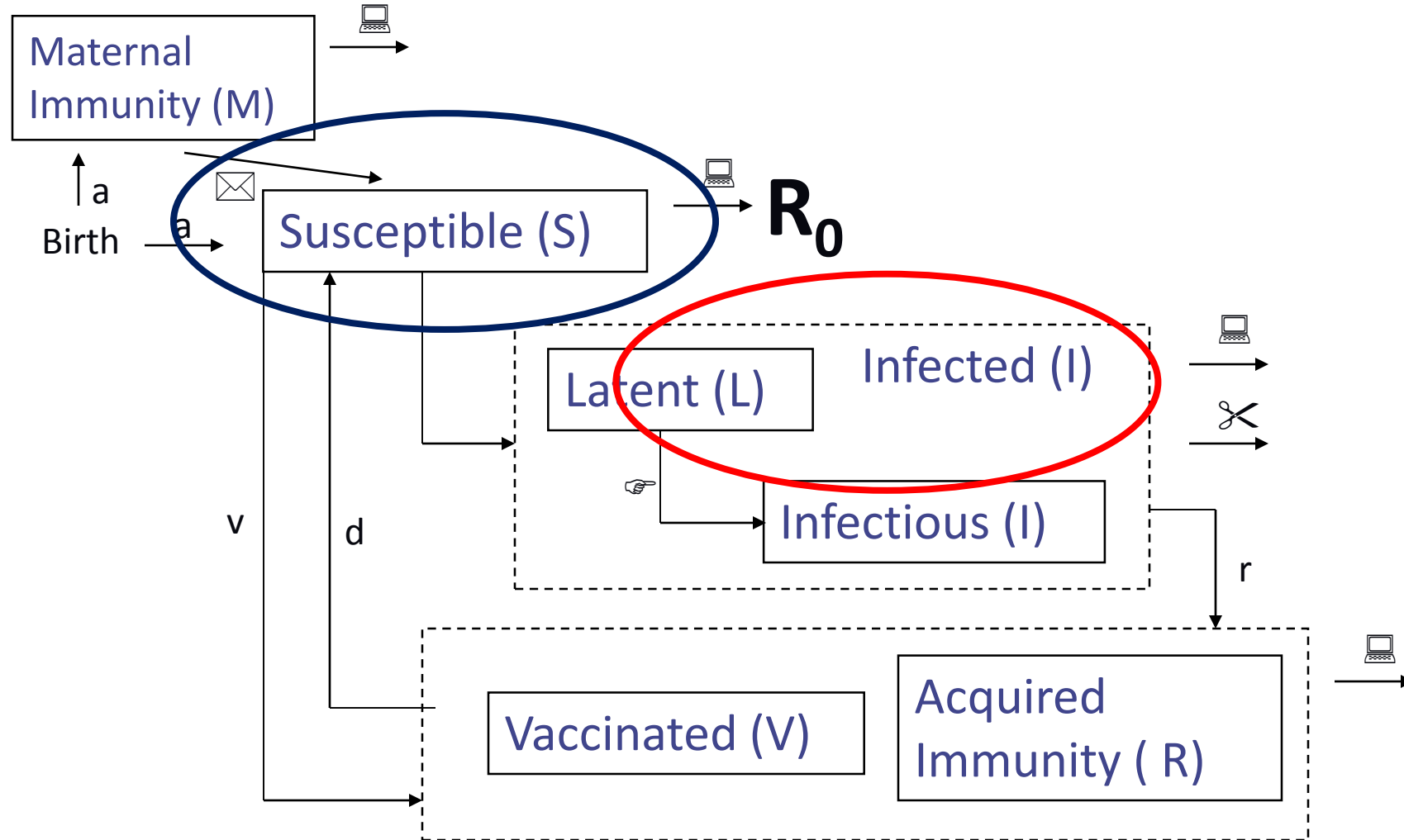
Emerging zoonosis	Primary animal host	Amplifying animal host	Geographical impact	Approximate dates
HIV-AIDs	Primates		Global with major burden in Africa	Late 1970s to present
Ebola	Bats*	?	Africa (Central, East, West)	Varied outbreaks; major epidemic in 2015
Nipah	Bats	Pigs	SE Asia	
Severe Acute Respiratory Syndrome (SARS)	Bats	Civets	Origin in China to multiple other countries	2003
Middle-East Respiratory Syndrome (MERS)	Bats	Camels	Middle East and East Africa	2008 to present
Covid-19	Bats	tbd	Origin in China to Global	December 2019 to ?
Avian flu (H5N1)	Wild birds	Poultry	E/SE Asia to global (Americas relatively spared)	2005 to 2010
"Swine" flu (H1N1)	Pigs		Global	2009

Source: [Bett, Randolph, McDermott, 2020](#)

# Types of Infectious Diseases

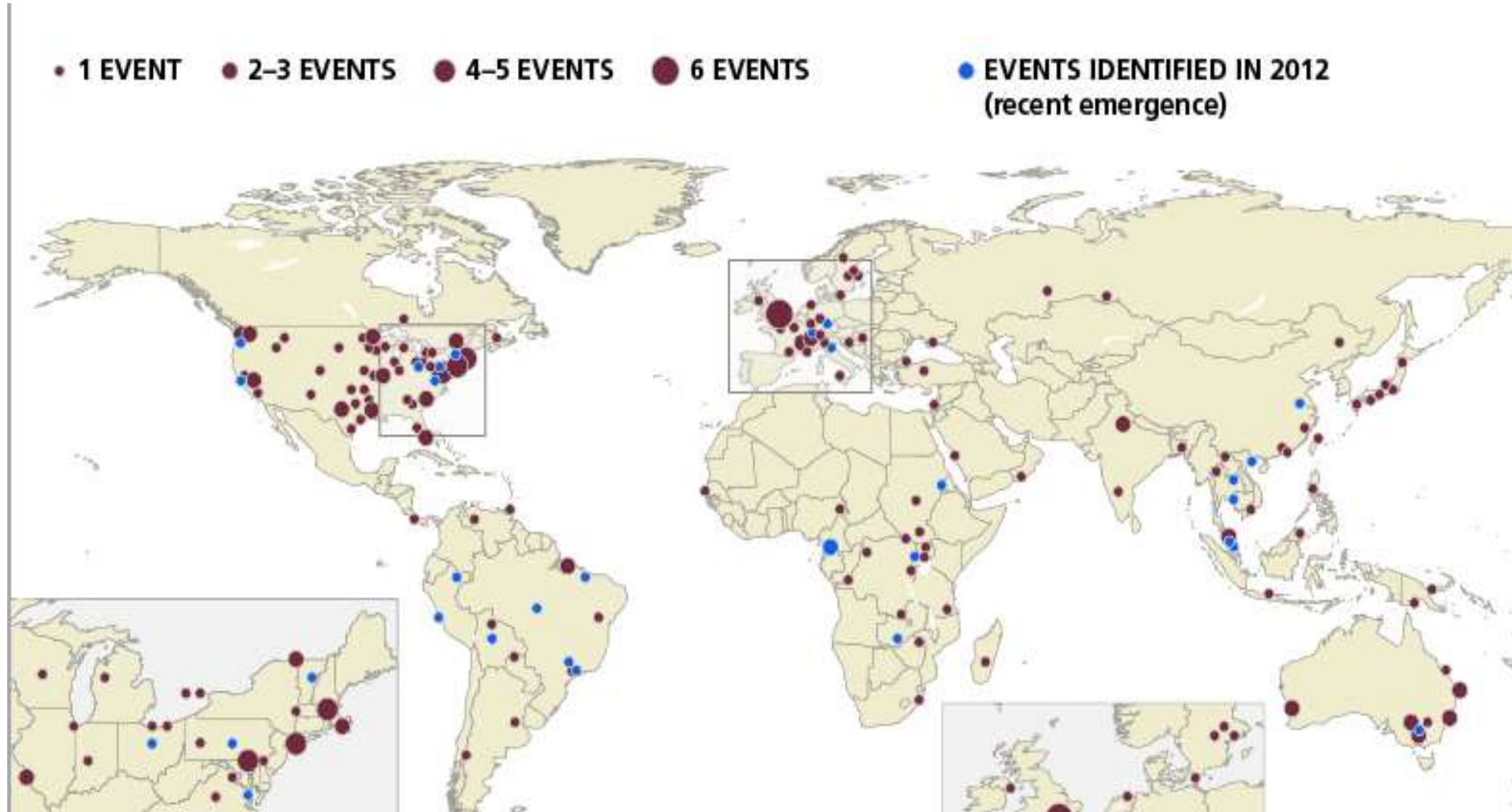
1. Directly transmitted microparasites
  - Viruses, bacteria, protozoan
  - Transmitted by direct contact, water,
2. Indirectly transmitted microparasites
  - Same microparasites but vector-borne
3. Macroparasites
  - Host and free-living stages (e.g. helminths)
  - Direct and indirect

# Infectious states: Directly transmitted microparasites



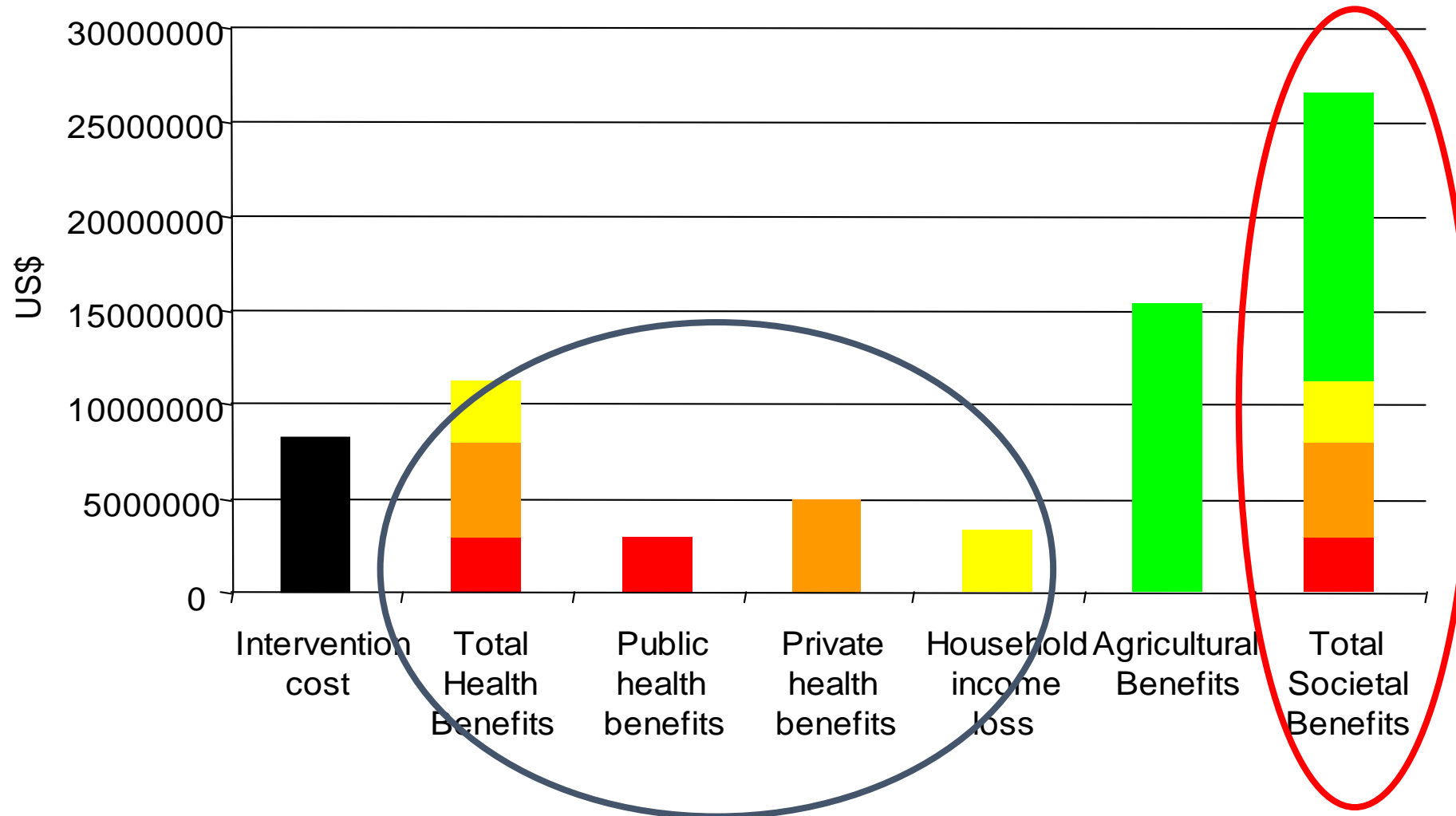
# Diagnosics – What is the real incidence and burden of disease emergence

(zoonoses are 75% of EIDs and cost \$6.7 billion a year)

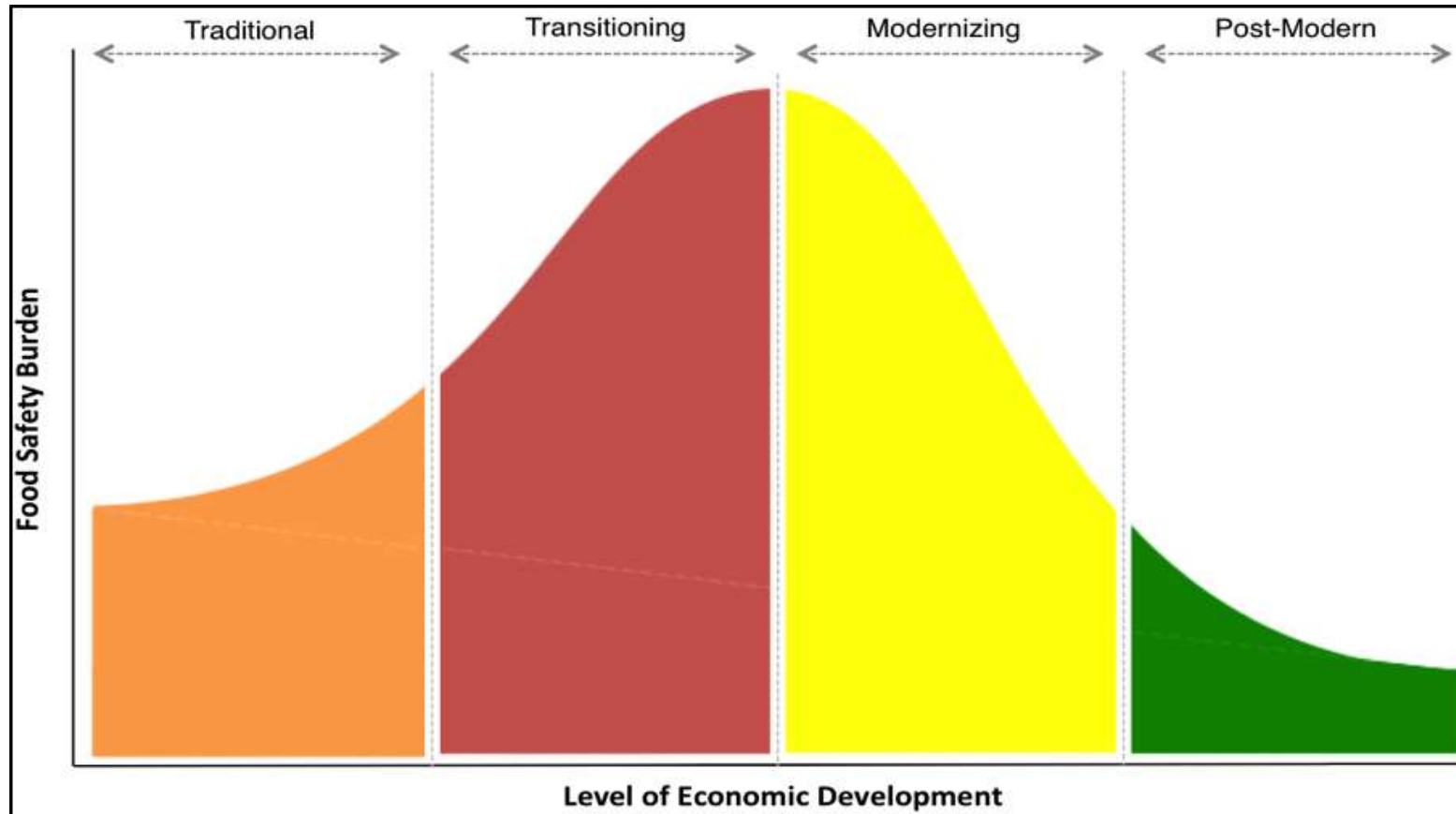




# Economics of zoonoses : human and livestock disease



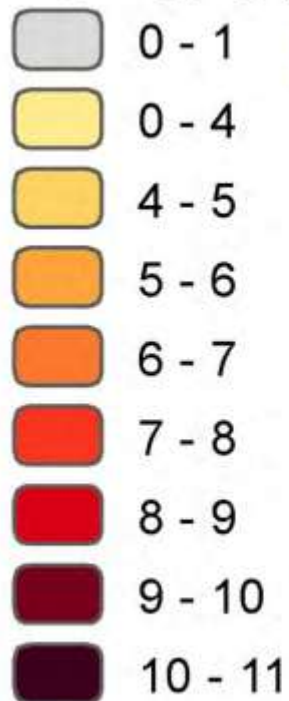
# Food safety evolves – greatest burden in middle-income countries



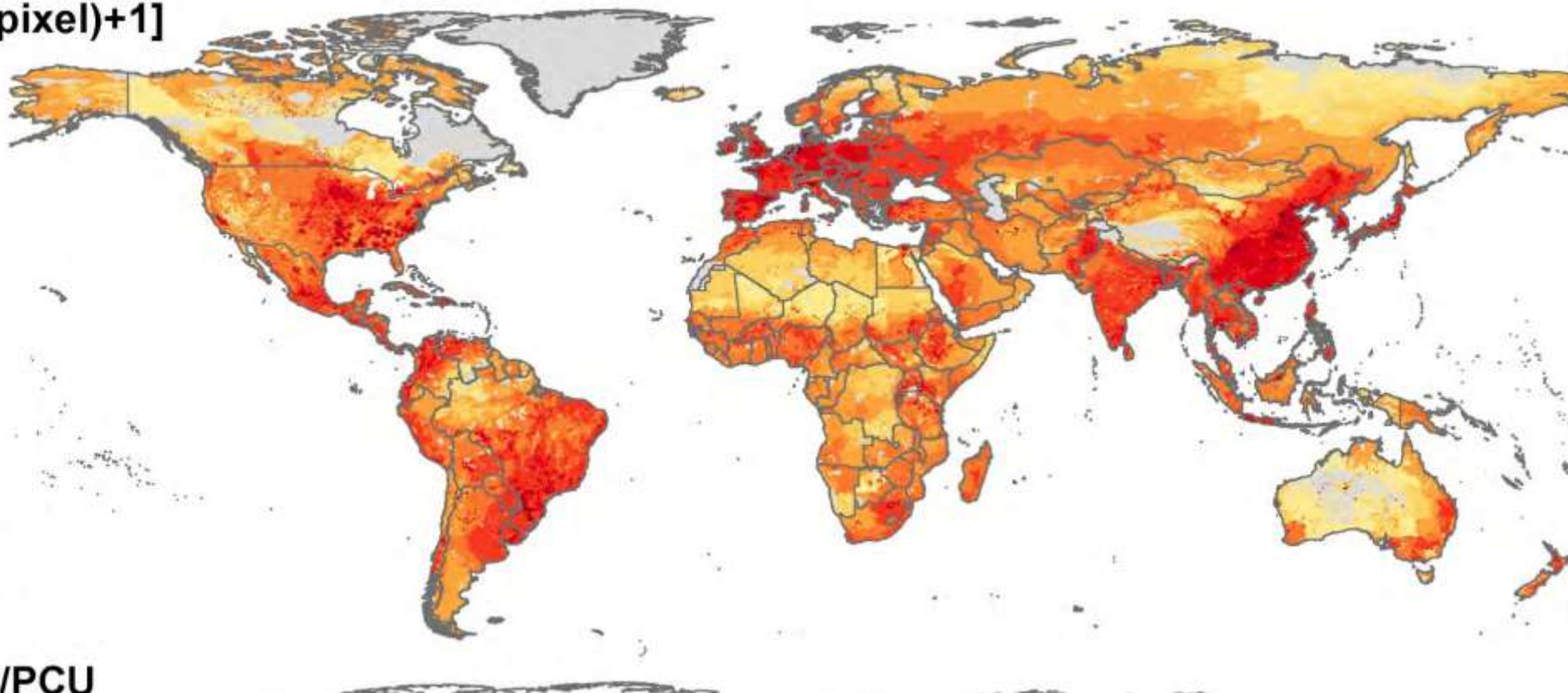
*World Bank, 2018. The Food Safety Imperative*

# Antimicrobial use in agriculture

Log10 [(mg/pixel)+1]



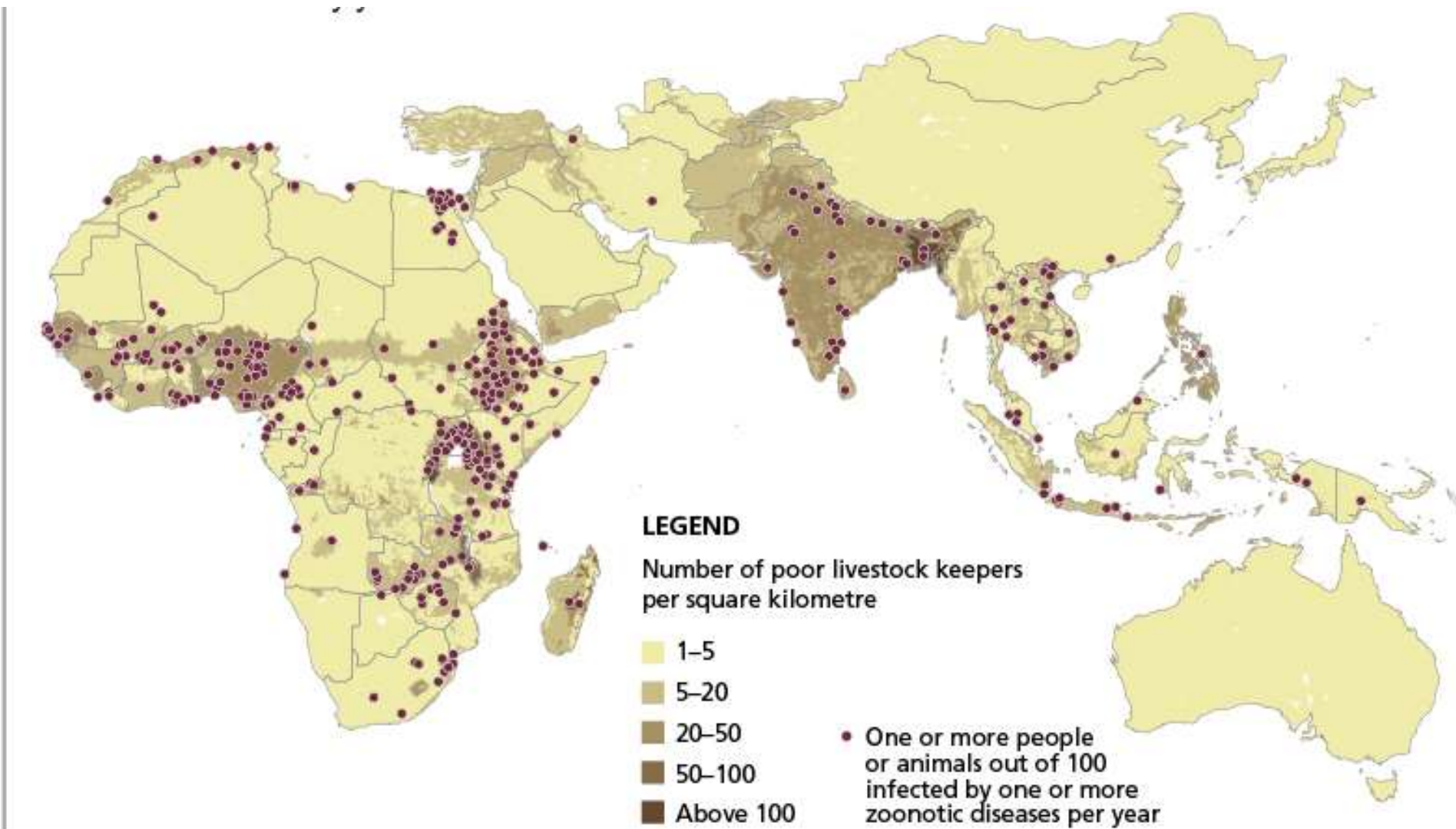
Std. Dev. ma/PCU



Van Boekel et al., 2015

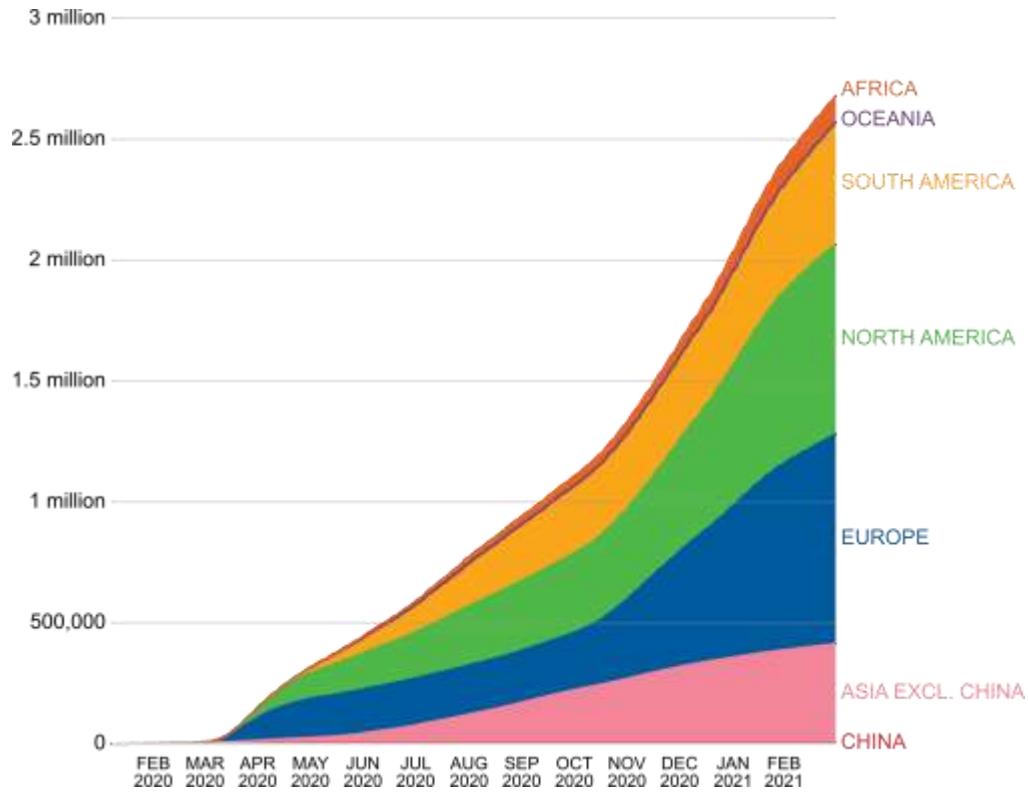


# Poor are most affected by zoonoses and FBD



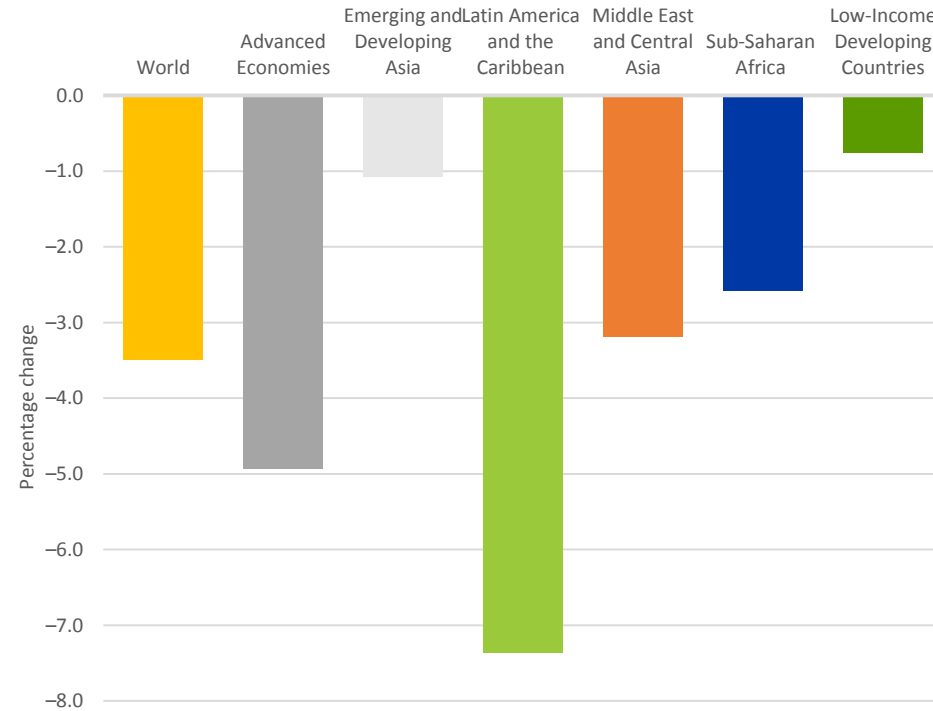
# COVID-19 Year One: Deaths and economic disruption

Cumulative confirmed COVID-19 deaths



Source: Johns Hopkins University, CSSE COVID-19 Database (updated March 18, 2021).

Real GDP growth, 2020



Source: IMF, *World Economic Outlook*, January 2021 Update (Washington, DC: 2021).

# Health, food, and economics

Critical trade-offs among health, food systems, and economic goals. Multisectoral perspective and clearly defined values values needed.

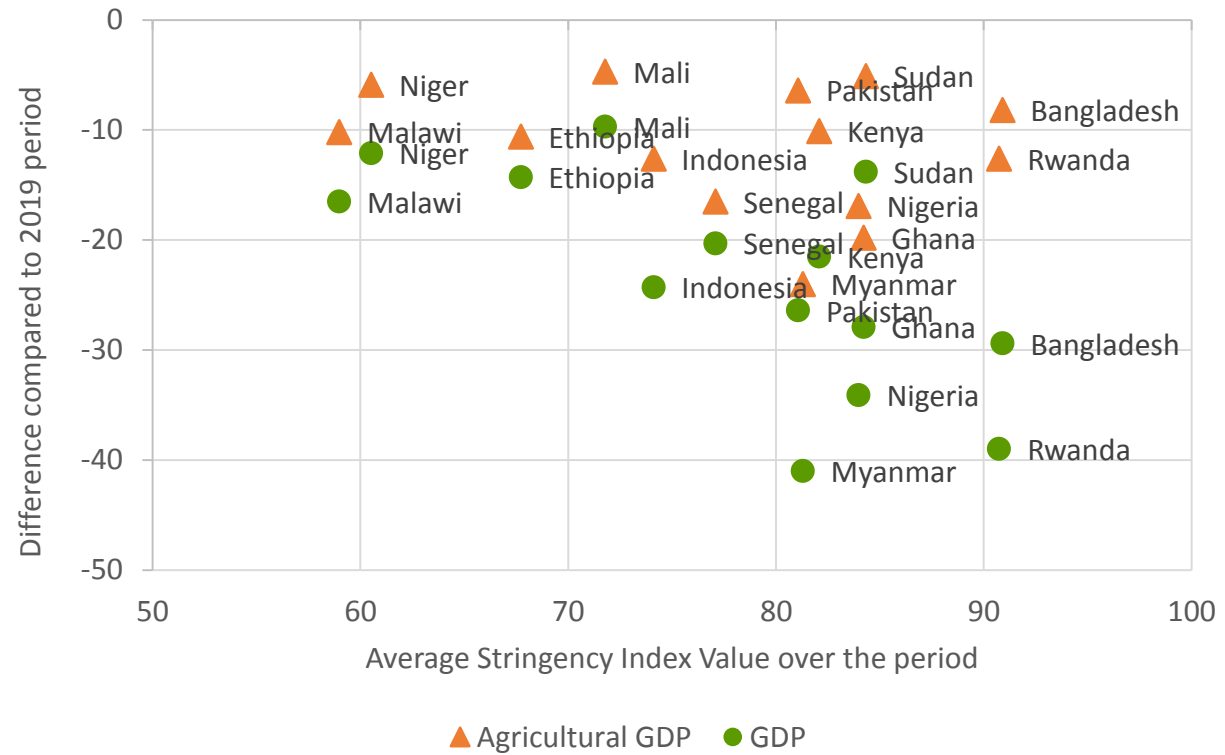
Increase understanding of of the interplay of health, economic, and social policy policy actions.

Develop processes for policy policy coordination and increase capacity of policymakers to work across across multiple sectors.

From: McDermott, IFPRI GEPR, 2021

[www.e4fn.cgiar.org/covid19/](http://www.e4fn.cgiar.org/covid19/)

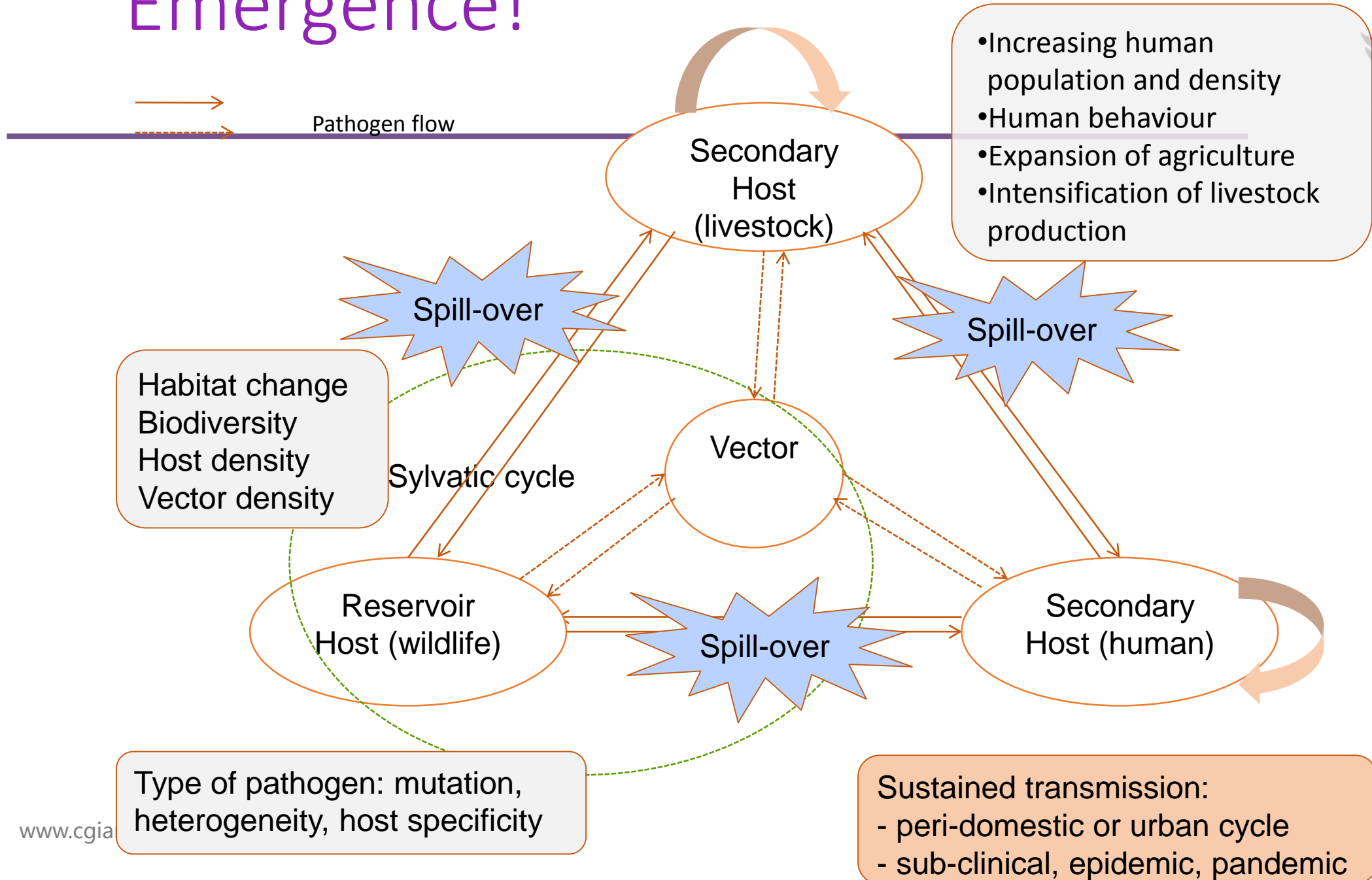
Lockdown stringency and change in GDP and agricultural GDP



Source: Stringency data are from H. Thomas et al., Oxford's COVID-19 Government Response Tracker, Blavatnik School of Government ([www.bsg.ox.ac.uk/covidtracker](http://www.bsg.ox.ac.uk/covidtracker), accessed Feb. 8, 2021).

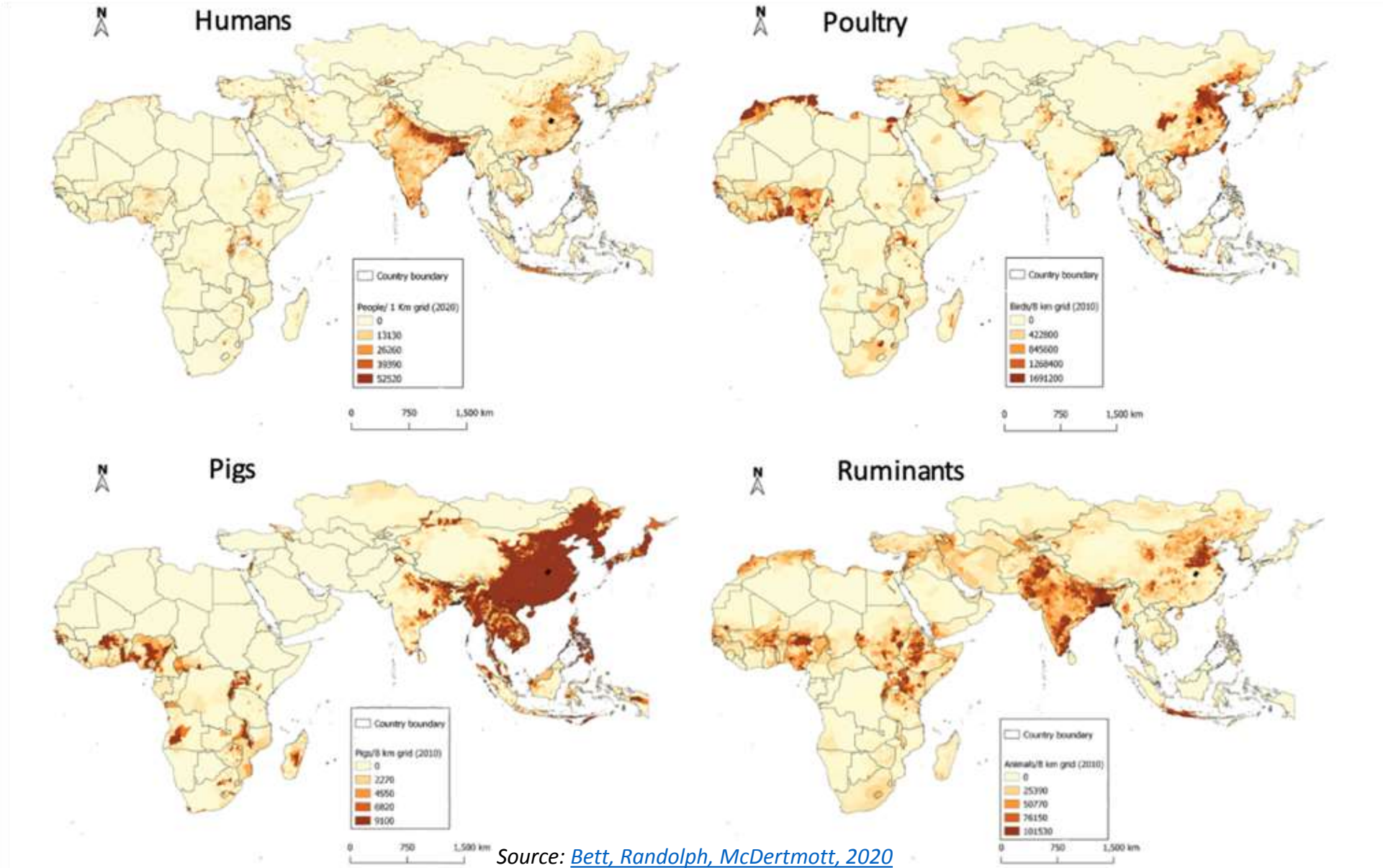
# Emergence!

Jones et al., PNAS forthcoming





**FIGURE 1** Population densities of humans, poultry, pigs, and ruminants in Africa and Asia



Source: [Bett, Randolph, McDermott, 2020](#)

Future emerging zoonoses in Africa will be more frequent, larger



## PREVENTING THE NEXT PANDEMIC

### Zoonotic diseases and how to break the chain of transmission



A Scientific Assessment with Key Messages for Policy-Makers  
A Special Volume of UNEP's Frontiers Report Series

Preventing the Next Pandemic: Zoonotic diseases  
and how to break the chain of transmission.

<https://hdl.handle.net/10568/108707>



# The unfinished agenda - challenges

- Good experience in linking human and animal health and sometimes environmental but:
  - in specific communities or locations;
  - around specific events / outbreaks; and
  - at pilot intervention scale
- Capacity is more responsive than preventive
- Dynamic change
  - urbanization, intensification, habitat destruction, pathogen change
  - Disease emergence (vector-borne diseases (JE, Zika, Chikangunya) (AMR)
- Economics and Tradeoffs – fear and threat; health burden (DALYs)





M.Hasan, o/Photoshare

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