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Overview of One Health Surveillance

Workshop: Infectious Disease Surveillance

Institute of Social and Preventive Medicine (ISPM)

Nov 25, 2019

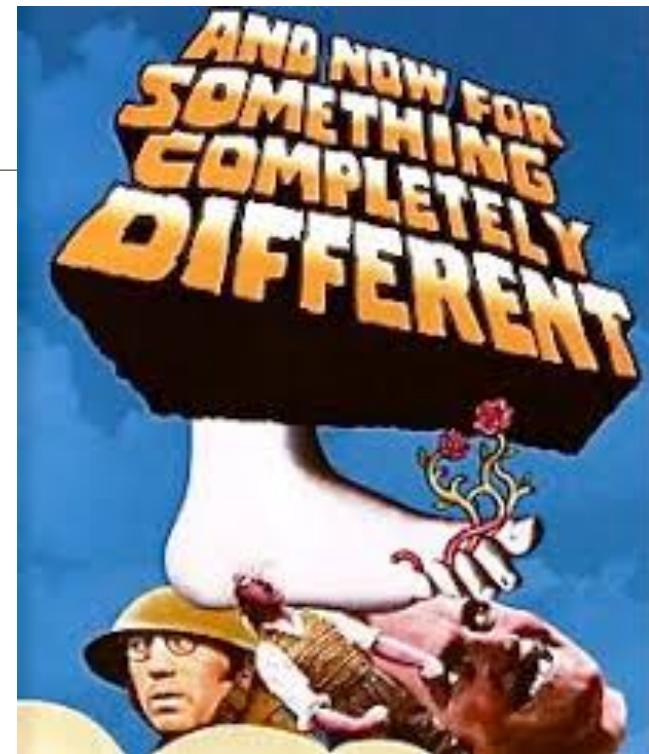


J Berezowski

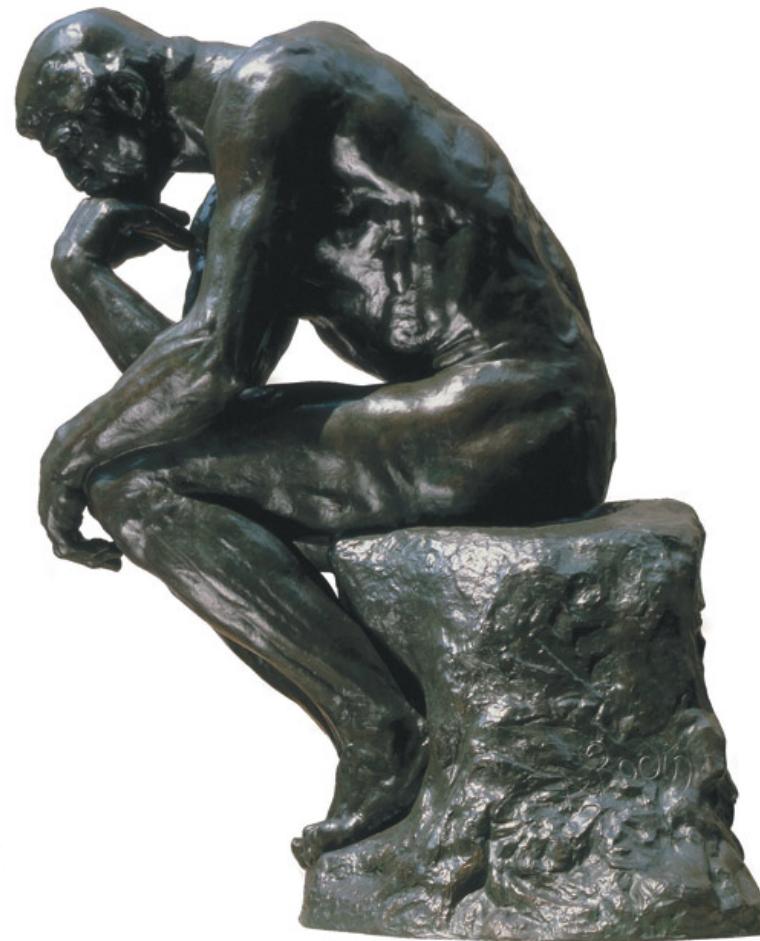
Veterinary Public Health Institute
University of Bern, Switzerland

Outline

- Why OH surveillance?
- What is OH surveillance?
- Diseases under surveillance
- Information
- Data
- Integration/collaboration/transdisciplinarity
- Summary



Why One Health Surveillance?



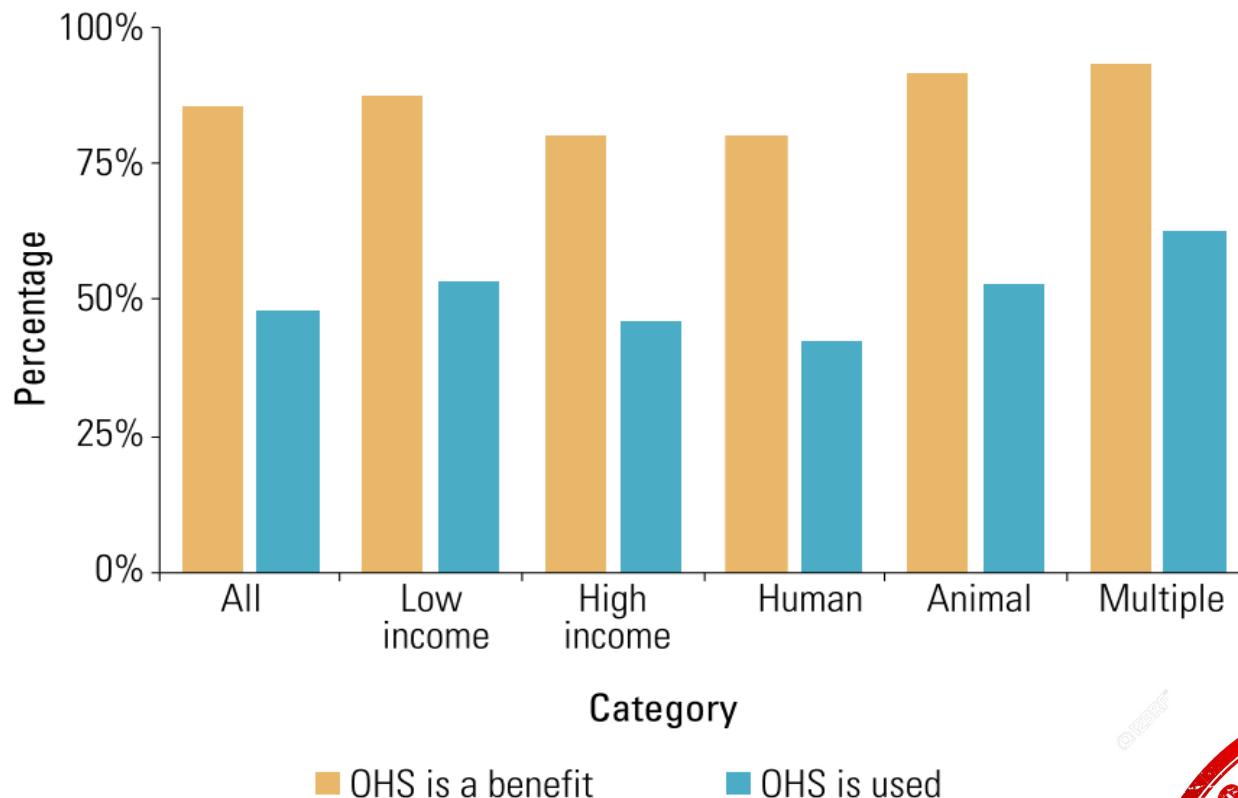
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Surveillance practitioners report "valuing" OHS



85% (148/185) of surveillance practitioners

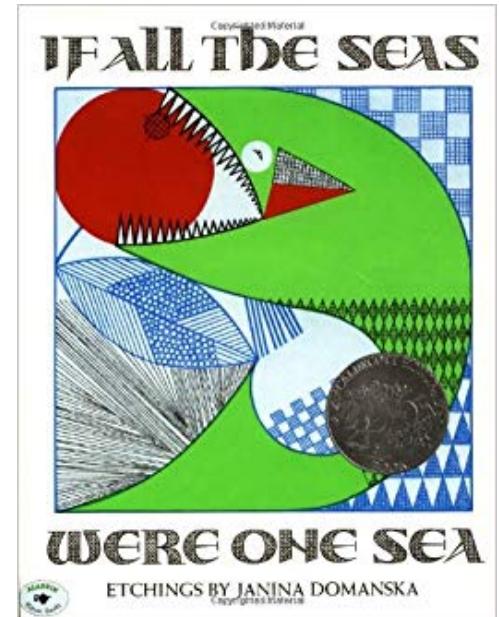
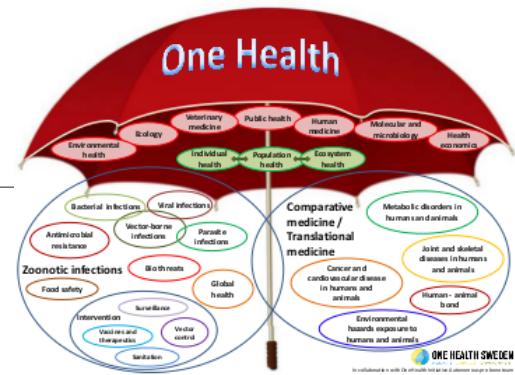
Berezowski et.al. One health surveillance: perceived benefits and workforce motivations
Rev. Sci. Tech. Off. Int. Epiz., 2019, 38 (1), 251–260



Precieved benefit of OH

Collaborative OH surveillance benefits:

- **Economic:** greater efficiency of disease surveillance and control
- **Knowledge:** understand changing dynamics of disease
- **Health:** reduce burden of zoonotic diseases



Tripartite Concept
Note 2010



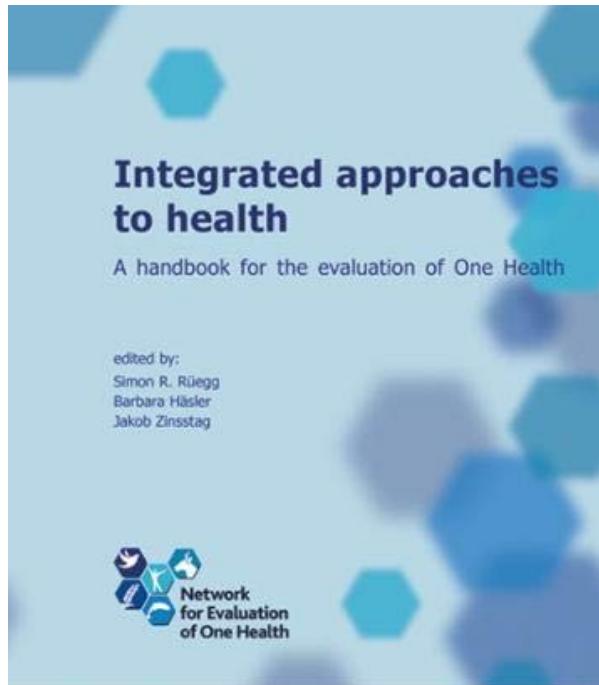
Precieved benefit of OH **vs Proven Benefit**

Collaborative OH surveillance benefits:

- **Economic:** greater efficiency of disease surveillance and control
 - WNV surveillance (Paternoster 2017)
 - Multi-zoonotic disease surveillance systems: (LMIC)
- **Knowledge:** understand changing dynamics of disease
- **Health:** reduce burden of zoonotic diseases



Precieved benefit of OH **vs Proven Benefit**



Intangible benefits:

- Value of: collaboration, learning, information, knowledge capital, societal benefits, etc.etc.

Focus on: Added Value of Collaboration

Babo Martins: Economic Assessment of Zoonoses Surveillance in a ‘One Health’ Context: A Conceptual Framework. 2015 Zoonoses and public health DOI: 10.1111/zph.12239



One Health Surveillance: A Matrix to Evaluate Multisectoral Collaboration

Marion Bordier^{1,2,3*}, Camille Delavenne^{1,3}, Dung Thuy Thi Nguyen^{4,5}, Flavie Luce Goutard^{2,4,5} and Pascal Hendrikx⁶ published: 24 April 2019 doi: 10.3389/fvets.2019.00109

Antoine-Moussiaux (2019) Valuing Health Surveillance as an Information System: Interdisciplinary Insights. Front. Public Health 7:138. doi: 10.3389/fpubh.2019.00138

EVOLvINC: Evaluating knOwLedge INtegration Capacity in multistakeholder governance

Martin Hitziger¹, Maurizio Aragrande², John A. Berezowski³, Massimo Canali², Victor Del Rio Vilas^{4,5}, Sabine Hoffmann⁶, Gilberto Iglesias^{7,8,9}, Hans Keune^{10,11}, Alexandra Lux^{12,13}, Mieghan Bruce¹⁴, Markus A. Palenberg¹⁵, Christian Pohl¹⁶, Miroslav Radeski¹⁷, Ina Richter¹⁸, Carmenza Robledo Abad¹⁶, Robert H. Salerno^{19,20}, Sara Savic²¹, Janina Schirmer¹⁸, Barbara R. Vogler²² and Simon R. Riegg¹



WHAT IS ONE HEALTH SURVEILLANCE?



A OH surveillance system is a system in which:

- collaborative efforts exist between at least two sectors (human health, animal health, plant health, food safety, wildlife and environmental health) at any stage of the surveillance process,
- to produce and disseminate information
- with the purpose of improving an aspect of human, animal or environmental health

Bordier, M., Preventive Veterinary Medicine, <https://doi.org/10.1016/j.prevetmed.2018.10.005>



OH Surveillance describes:

- the systematic collection, validation, analysis, interpretation of data collected on humans, animals and the environment
- dissemination of information to
- inform decisions for more effective, evidence- and system-based health interventions.

K.D.C. Stärk et al. Preventive Veterinary Medicine 120 (2015) 124–130



OH Surveillance describes:

- the systematic collection, validation, analysis, interpretation of data collected on humans, animals and the environment
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1

2

3

K.D.C. Stärk et al. Preventive Veterinary Medicine 120 (2015) 124–130



Health surveillance is an activity

Observation/data

Information

Decisions



Health surveillance is an activity

Observation/data

→ Information

Decisions About:

→ Human Health

Public Health
Surveillance



Health surveillance is an activity

Observation/data



Information



Decisions About:

→ Animal Health

Animal Health
Surveillance



Health surveillance is an activity

Observation/data

Information

Decisions About:

- Human Health
- Animal Health
- Environment

One Health
Surveillance



Health surveillance is an activity

Observation/data

Humans

Animals

Environment

Information

Decisions About:

- Human Health
- Animal Health
- Environment

**One Health
Surveillance**



Health surveillance



Observation/data

Humans

Animals

Environment

→ **Information**

→ **Decisions About:**

- Human Health
- Animal Health
- Environment

**One Health
Surveillance**



Health surveillance



Observation/data

Humans

Animals

Environment



Information

Decisions About:

- Human Health
- Animal Health
- Environment

One Health
Surveillance



Share-integrate data?
Share information?
New data collection?
New policy-legislation?
New institutions? Funding?

Observation/data

Humans

Animals

Environment



What Information?

Information

What diseases?
What decisions?

Who makes decisions?

Decisions About:

- Human Health
- Animal Health
- Environment

One Health
Surveillance



Share-integrate data?
Share information?
New data collection?
New policy-legislation?
New institutions? Funding?

Observation/data

Humans
Animals
Environment



One Health
Surveillance

What Information?

Information

The Devil
is in the
Details

What diseases?
What decisions?
Who makes decisions?

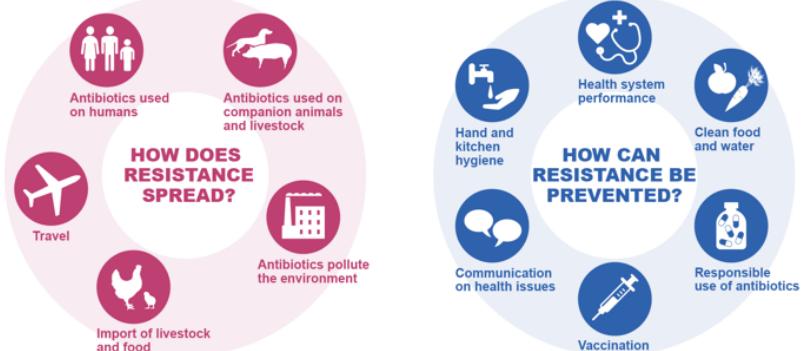
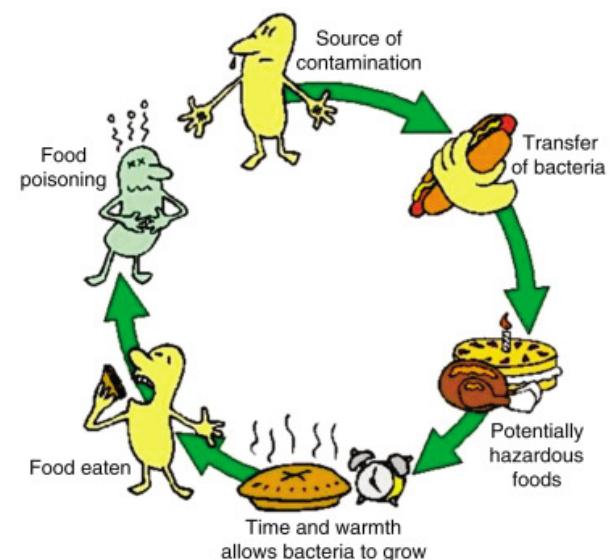
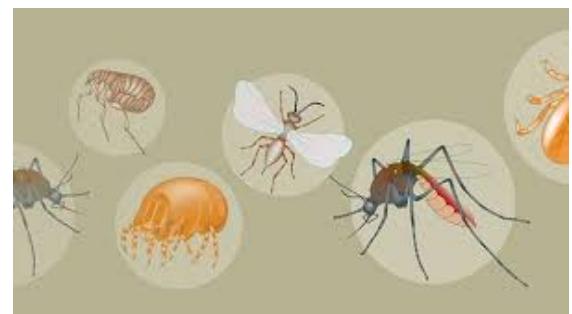
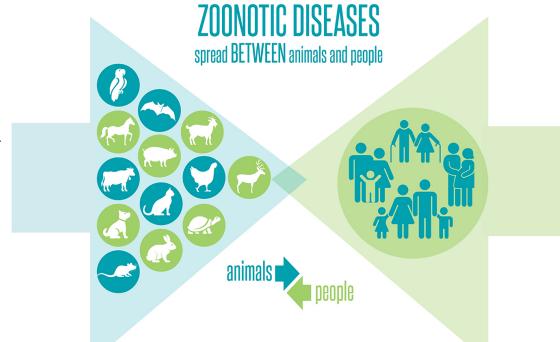
Decisions About:

→ Human Health
→ Animal Health
→ Environment



Hazards for OH surveillance

- Zoonotic diseases
- Vector borne zoonotic diseases
- Food borne diseases
- Antimicrobial resistance



Source: THL 2018

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Zoonotic Disease surveillance

Observation/data
Humans
Animals
Environment

Information

Decisions About:

- Human Health
- Animal Health
- Environment

**One Health
Surveillance?**

Zoonoses

- Influenza
- Rabies
- Ebola virus
- Schistosomiasis
- Tularemia
- Q Fever
- Echinococcus



Vector borne dz surveillance

Observation/data
Humans
Animals
Vectors
Environment

Information

Decisions About:

- Human Health
- Animal Health
- Environment

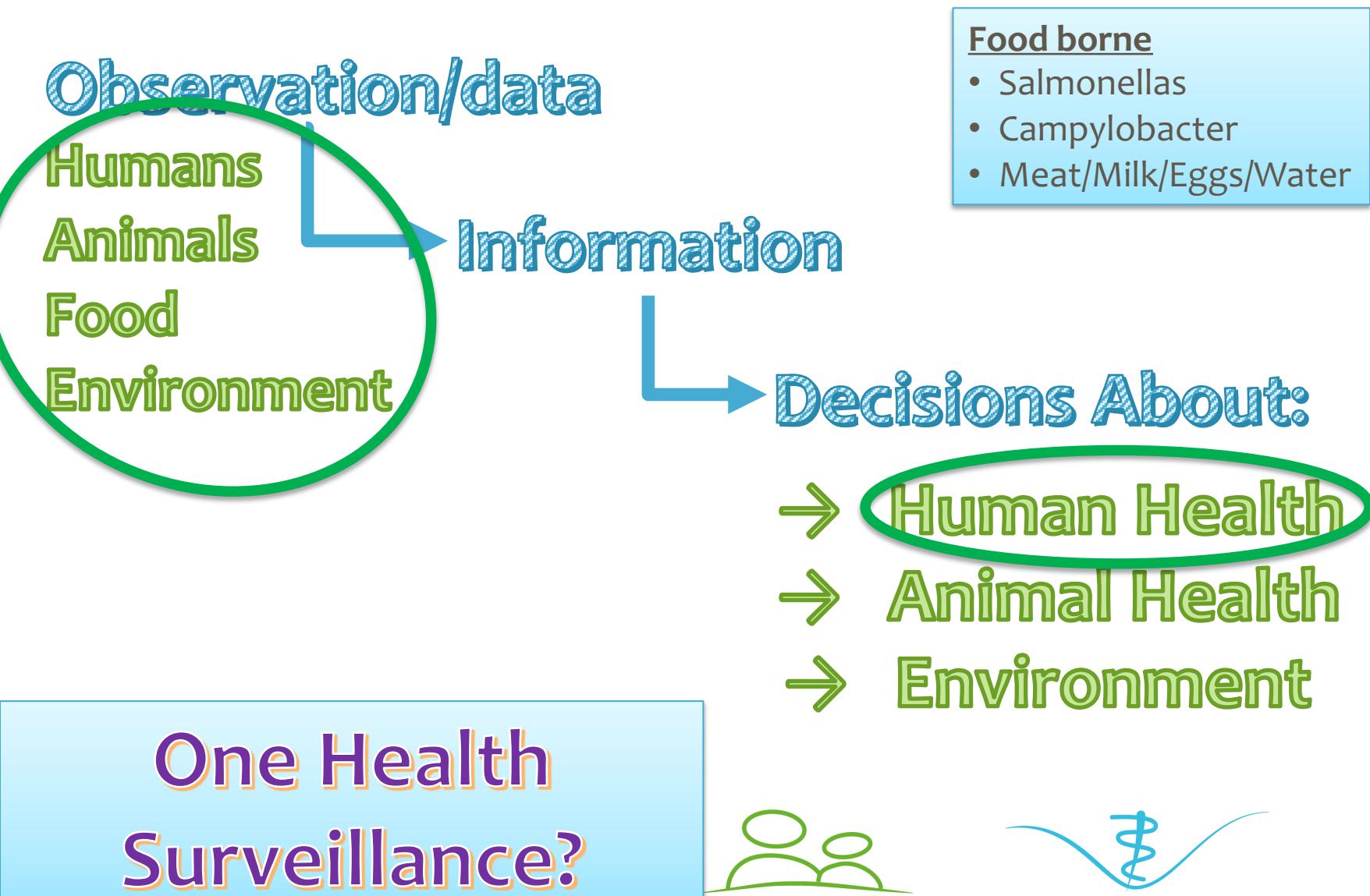
**One Health
Surveillance?**

Vector borne

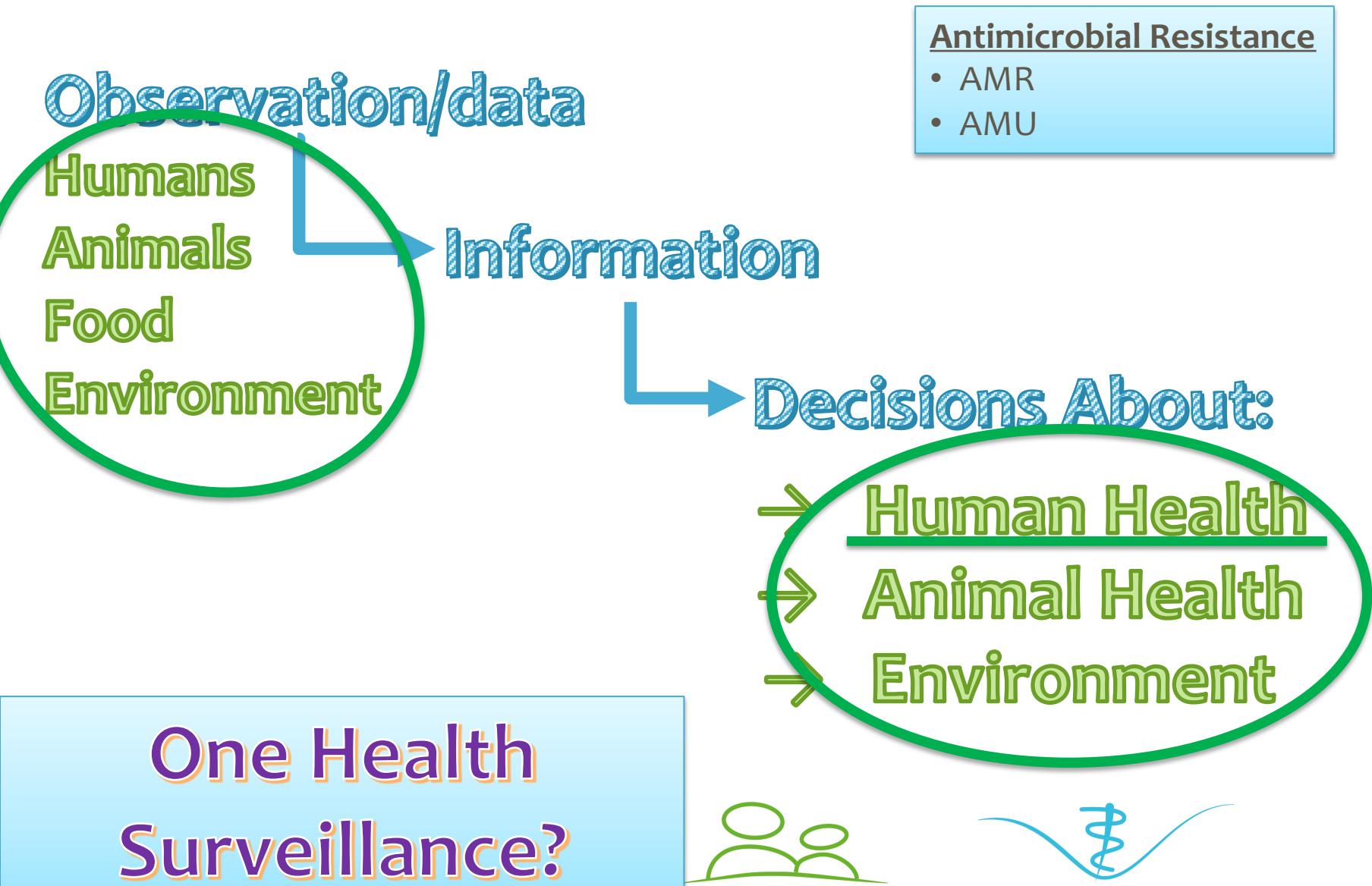
- West Nile Virus
- EEE, WEE, VEE
- Rift Valley Fever
- Dengue
- Chikungunya
- Borreliosis
- Yellow fever
- Japanes Encephalitis
- Kyasanur Forest Disease



Food borne disease surveillance



Antimicrobial resistance surveillance



Main concept of One Health:

Optimize health: people, animals and environment

- Zoonoses**
- Influenza
 - Rabies
 - Ebola virus
 - Schistosomiasis
 - Tularemia
 - Q Fever
 - Echinococcus

Vector borne

- West Nile Virus
- EEE, WEE, VEE
- Rift Valley Fever
- Dengue
- Chikungunya
- Borreliosis
- Yellow fever
- Japanes Encephalitis
- Kyasanur Forest Disease

Food borne

- Salmonellas
- Campylobacter
- Meat/Milk/Eggs/Water

Antimicrobial Resistance

- AMR
- AMU

Decisions About:

- Human Health
- Animal Health
- Environment

Decisions About:

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Main concept of One Health:

**Optimize health?
Health = 1 - disease**

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Vector borne

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Decisions About:

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Decisions About:

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- Animal Health
- Environment

Share-integrate data?
Share information?
New data collection?
New policy-legislation?
New institutions? Funding?

Observation/data

Humans
Animals
Environment



What Information?

Information

What diseases?
What decisions?
Who makes decisions?

Decisions About:

- Human Health
- Animal Health
- Environment

One Health
Surveillance



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Environment



What Information?

Information

Increased Risk
Multi-Species(human)
Pathogen
Exposure-Transmission

What diseases?
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Decisions About:

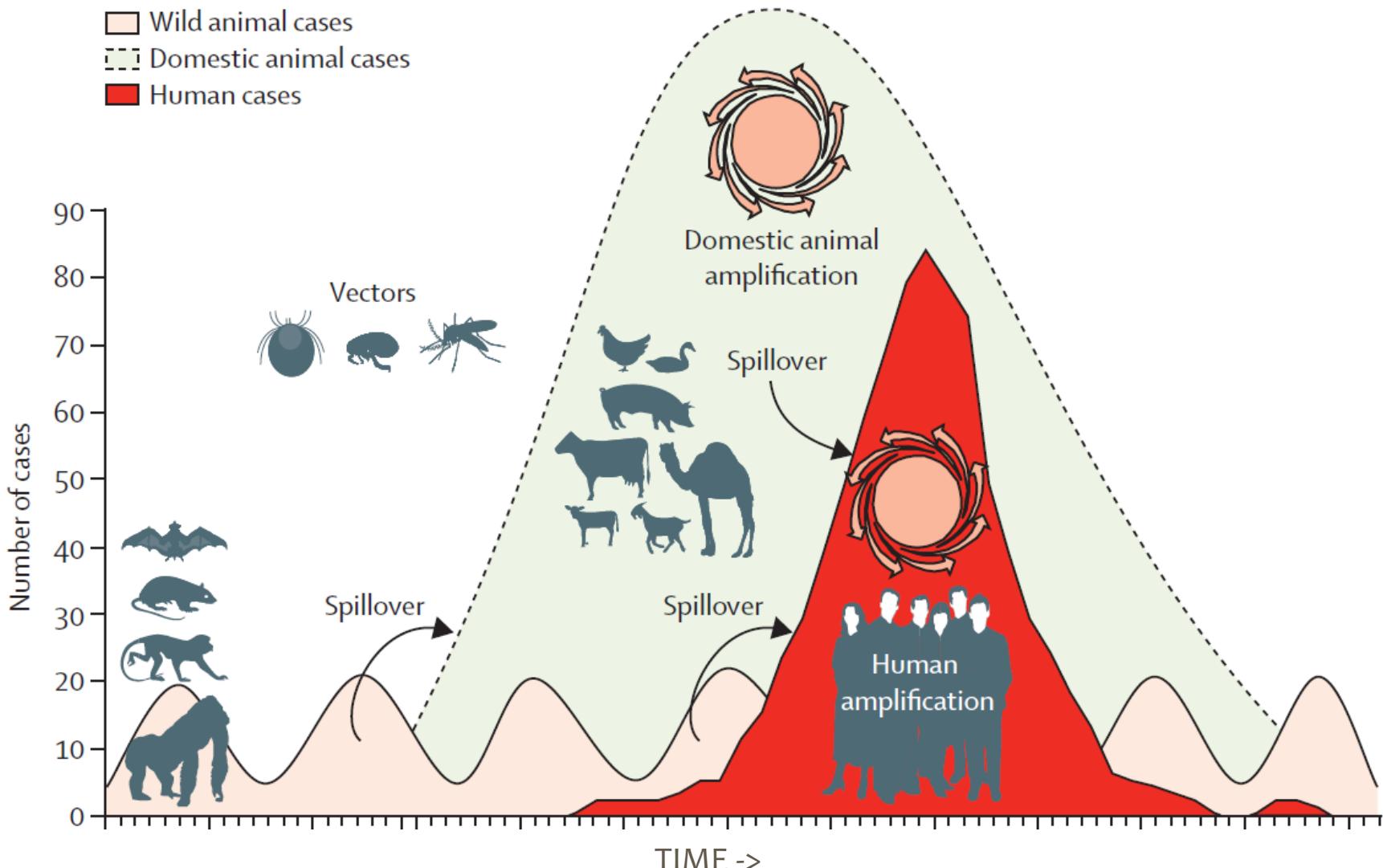
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One Health
Surveillance



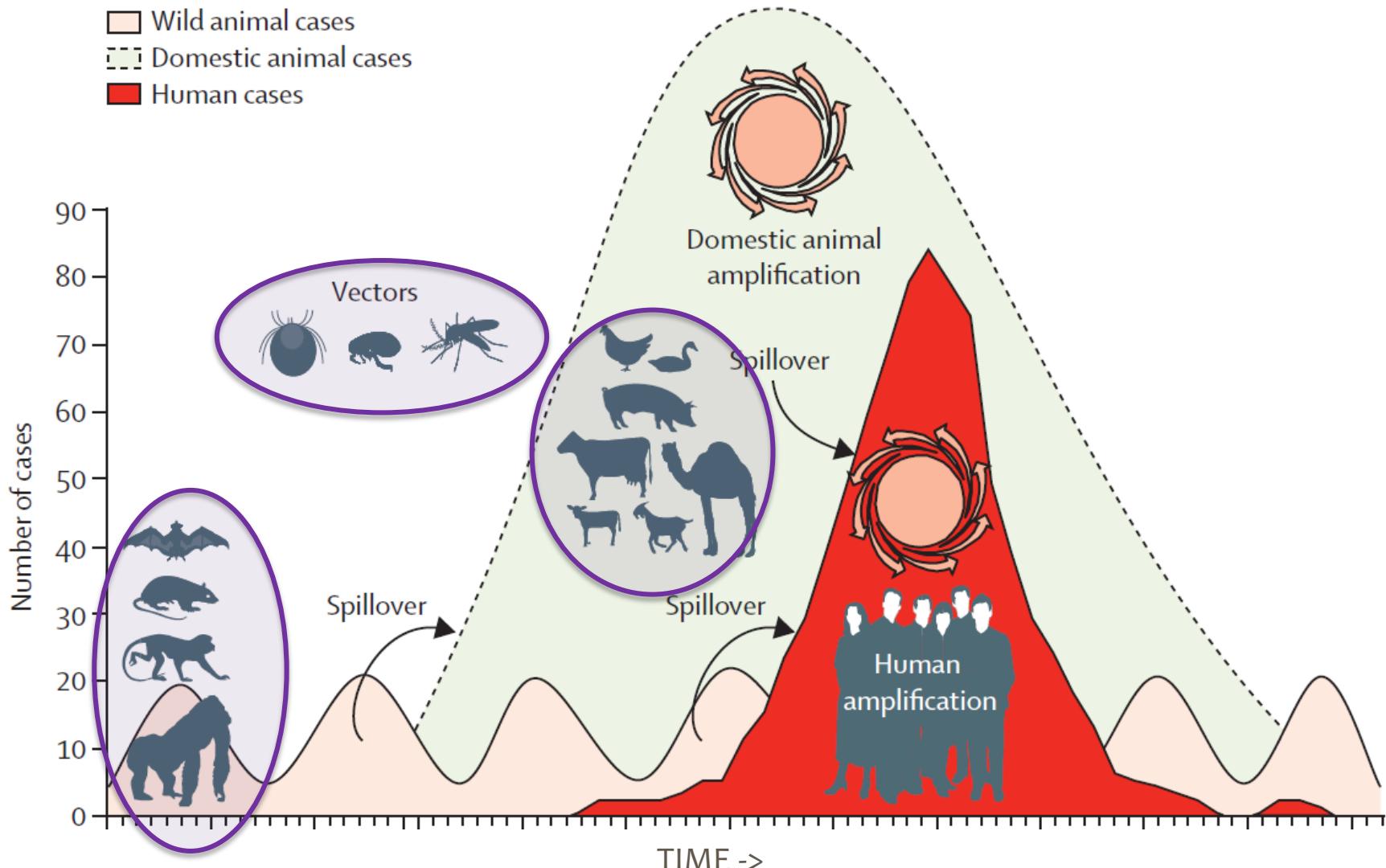
Increased Risk of Transmission of Zoonotic Pathogens

A



Increased Risk of Transmission of Zoonotic Pathogens

A



Zoonoses

- Influenza
- Rabies
- Ebola virus
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- Tularemia
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Decisions About:

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Vector borne

- West Nile Virus
- EEE, WEE, VEE
- Rift Valley Fever
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Decisions About:

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Food borne

- Salmonellas
- Campylobacter
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Decisions About:

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Antimicrobial Resistance

- AMR
- AMU

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Zoonoses

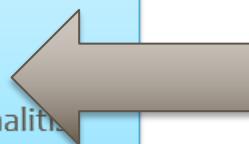
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Decisions About:

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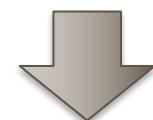
Food borne

- Salmonellas
- Campylobacter
- Meat/Milk/Eggs/Water

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Increased Risk Multi-Species(human) Pathogen Exposure-Transmission



Decisions About:

- **Human Health**
- Animal Health
- Environment

Antimicrobial Resistance

- AMR
- AMU

Decisions About:

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Zoonoses

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Decisions About:

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Vector borne

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Decisions About:

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Food borne

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- Campylobacter
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Decisions About:

- **Human Health**
- Animal Health
- Environment

Antimicrobial Resistance

- AMR
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Decisions About:

- **Human Health**
- Animal Health
- Environment

Optimize health?
Health = 1- disease



Increased Risk
Multi-Species(human)
Pathogen
Exposure-Transmission

Share-integrate data?
Share information?
New data collection?
New policy-legislation?
New institutions? Funding?

Observation/data

Humans

Animals

Environment



One Health Surveillance

What Information?

Information

Data Integration And Collaboration

What diseases?
What decisions?

Who makes decisions?

Decisions About:

- Human Health
- Animal Health
- Environment



Integration of zoonotic disease surveillance data

Wendt (2015): Germany; not possible to combine public-animal-environmental data. Collaboration between domains is needed.

Houe (2019): Denmark: Due to the complexity of databases, full integration at the individual level is often not possible. But Integration is possible at a higher level.

Faverjon (2019): Switzerland: Pig and pork production. Data is complex and messy, but can be integrated at various levels.



Collaborative data collection systems: LMIC

- **Kazakhstan** Electronic Integrated Disease Surveillance System. Collects human, animal, environmental, laboratory and clinical data (Burkadov 2012)
- **Kenya ZooLinK**: Sentinel communities: collect samples and data from slaughter plants, animal markets and hospitals. 15 zoonotic disease (Falzon 2019)
- **Mozambique**: febrile patients, livestock and wildlife, mosquitoes and ticks. Zoonotic diseases (Gudo 2015)



Collaborative data collection systems: LMIC

- Kazakhstan Electronic Integrated Disease Surveillance System. Collects human, animal, environmental data (Burkhardt et al. 2019)
- Kenya Zoonotic disease surveillance systems collect samples from markets, animal markets (Falzon et al. 2019) have not been widely implemented
- Mozambique: febrile patients, livestock and wildlife, mosquitoes and ticks. Zoontic diseases (Gudo 2015)

High Income Countries

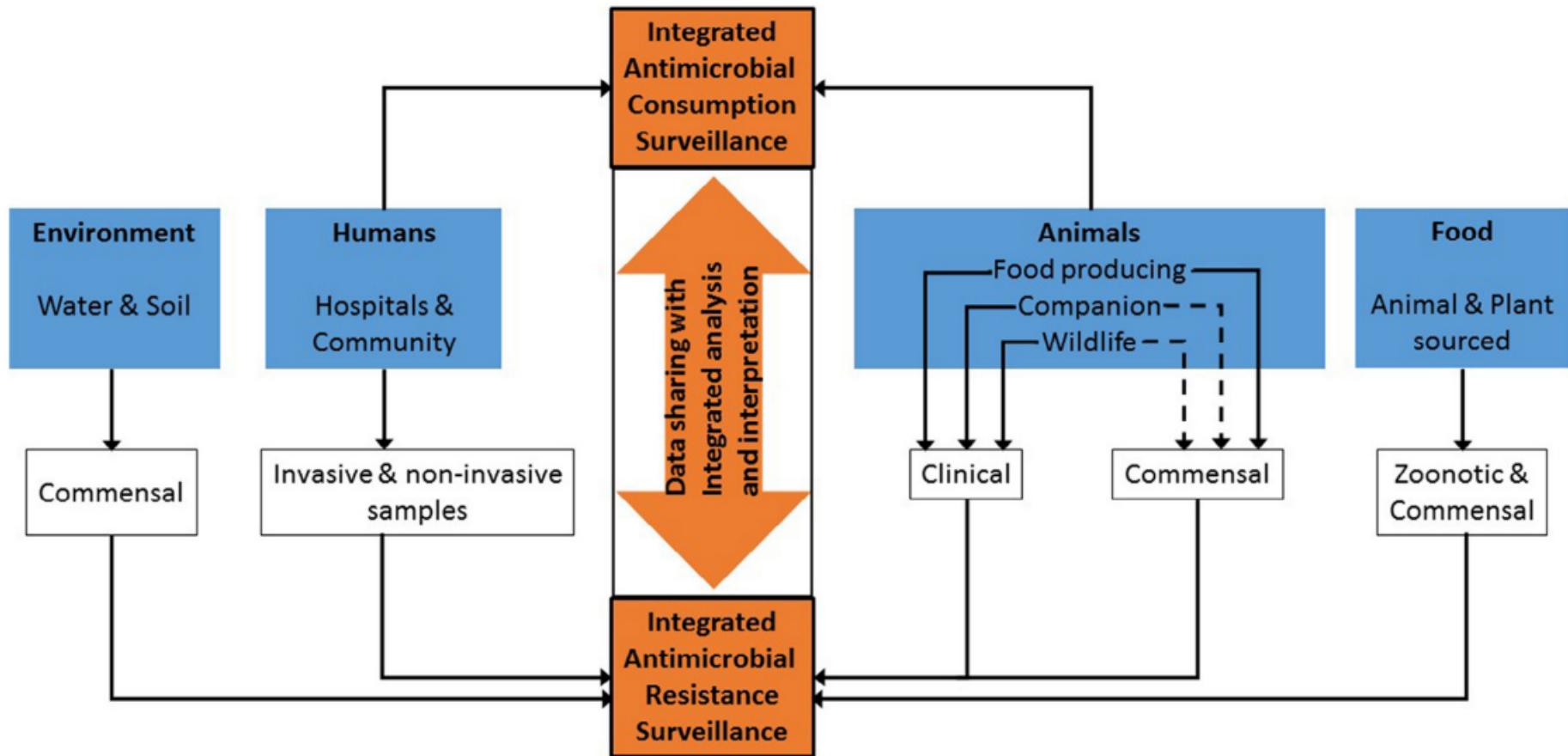
Collaborative systems
for

zoonotic disease surveillance
have not been widely
implemented

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AMR/AMU Surveillance



FROM: Queenan 2016 A One Health approach to antimicrobial resistance surveillance: is there a business case for it? International Journal of Antimicrobial Agents 48 (2016) 422–427

Where should collaboration occur?

1. At the policy-level:

Definition of the collaborative surveillance strategy across sectors, disciplines and decision scales

Definition of the rationale and objective for implementing a collaborative surveillance system

Definition of the areas of action for the main stakeholders

Identification of mechanisms for resources allocation



2. At the institutional-level:

Definition of the collaboration modalities across sectors, disciplines and decision scales

Definition of the areas of collaboration along the surveillance process (planning, data collection, data sharing, data analysis/interpretation, dissemination)

Definition of the role and responsibilities of each stakeholder for the implementation of collaboration

Allocation of necessary financial, material and human resources



3. At the operational-level:

Organisation of the collaborative activities in each institution involved and at all decision scales, to implement the desired collaboration modalities

Definition of detailed procedures to ensure the collaboration operations

Development of technical mechanisms and tools to support the collaboration operations

Management of allocated resources for the collaboration operations

Where should collaboration occur?

1. At the policy-level:

Definition of the collaborative surveillance strategy across sectors, disciplines and decision scales

Definition of the rationale and objective for initiating the collaborative surveillance

Definition of the areas of action for

Identification of mechanisms for

Talk....

....not alot of action....

....yet

Definition of the collaborative surveillance

(data collection, data sharing, data analysis/interpretation, dissemination)

for the implementation of
collaboration

resources



3. At the operational-level:

Organisation of the collaborative activities in each institution involved and at all decision scales, to implement the desired collaboration modalities

Definition of detailed procedures to ensure the collaboration operations

Development of technical mechanisms and tools to support the collaboration operations

Management of allocated resources for the collaboration operations

Share-integrate data?
Share information?
New data collection?
New policy-legislation?
New institutions? Funding?

Observation/data

Humans
Animals
Environment

What Information?

Transdisciplinary
Surveillance
and
Disease control

Information

What diseases?
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Who makes decisions?

Decisions About:

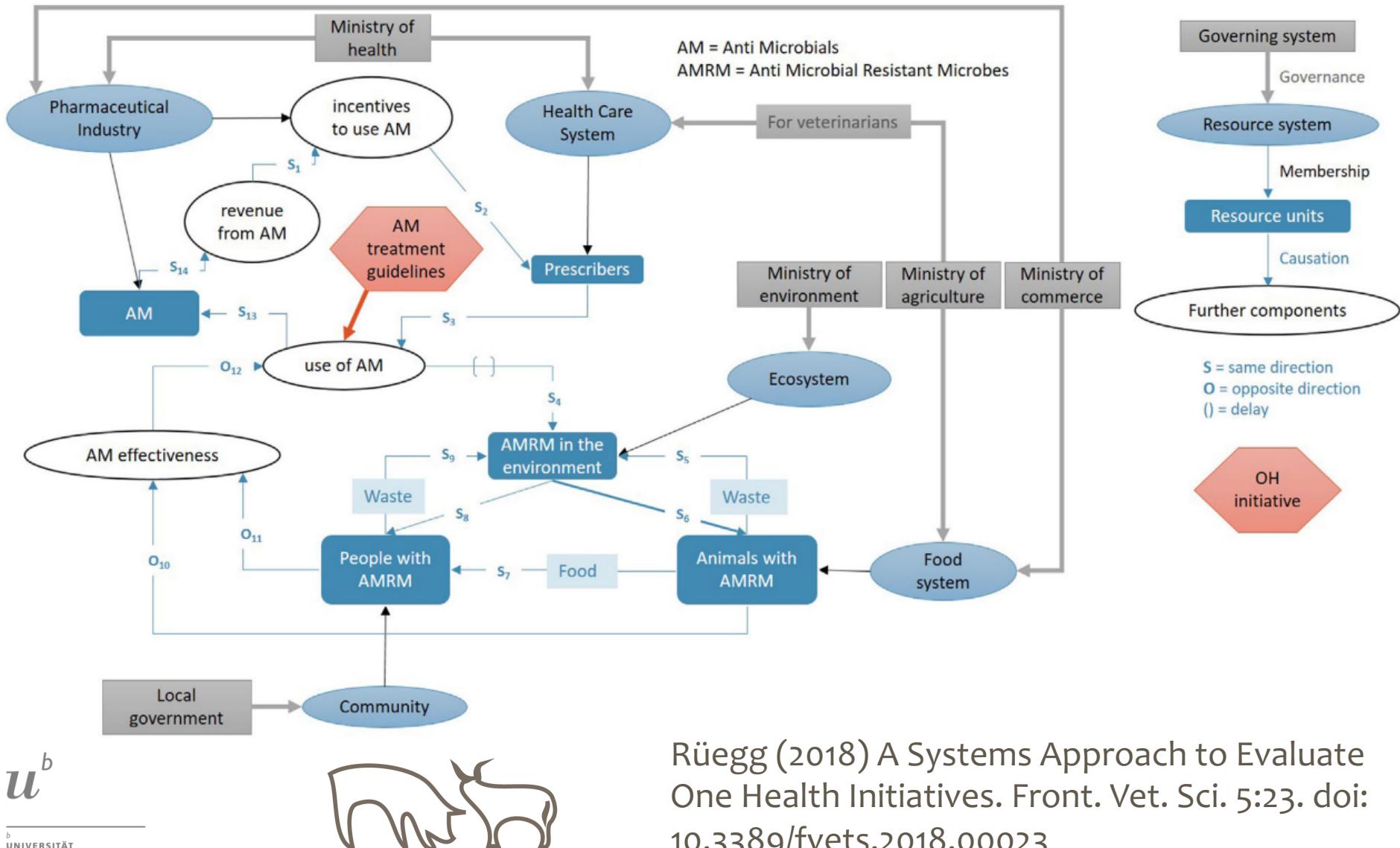
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One Health
Surveillance



AMR a One Health Perspective



Roadmap to a One Health agenda 2030

Queenan, K; Garnier, J; Rosenbaum, N; Buttigieg, S; de Meneghi, D; Holmberg, M; Zinsstag, J; Rüegg, Simon R; Hässler, B; Kock, R



Summary

- No clear common understanding of OH surveillance
- Currently OH Surveillance is used for:
 - Estimating increased multi-species disease risk
 - Reducing human disease risk (health = 1 – disease)
- Challenges: integration and collaboration
- Not used for broader benefits of OH
 - Animal-environmental-ecosystem health?
- Future is indeterminant
 - We have yet to explore the full value of OH and OH surveillance



**Thank You!
Questions?**

