Biosecurity: Challenges in Africa

Presidential Advisory Council on Combatting Antibiotic-Resistant Bacteria

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Biosecurity - Three Levels

Adapted from Stephen R. Collett, BSc, BVSc, MMedVet

Conceptual Biosecurity:

- Revolves around the location of animal facilities and their various components.
- Physical isolation – away from public roads, limiting the use of common vehicles, limiting access by personnel not directly involved with the operation, and controlling vermin, wild animals, and wind.

Structural Biosecurity:

- Farm layout, perimeter fencing, drainage, number/location of changing rooms, and housing design.
- Planning and programming; on-site movement of vehicles, equipment, and animals; traffic patterns; and feed delivery/storage.

Procedural Biosecurity:

- Routine procedures to prevent introduction (*bioexclusion*) and spread (*biocontainment*) of infection within a facility. These activities should be constantly reviewed and adjusted as needed. “All-in-all out”, regulation on workers …

The tenets of biosecurity have been long recognized by veterinarians. However, throughout the past decades, interest in biosecurity as a scientific discipline has surged

the term biosecurity and the structure and focus of biosecurity programs have evolved throughout time to more accurately reflect the scientific community's evolving perception of disease as well as the needs of the consumer, the veterinary profession, and producers and owners. (diseases, bioterrorism)

In modern animal medicine, biosecurity is probably best defined as "**all procedures implemented to reduce the risk and consequence of infection with a disease-causing agent**." – the complex interaction between the host, the disease-causing agent, and the environment. (epidemiological triangle … expansion – socioeconomic status, weather, abiotic realm, genetics …)

Biosecurity can be considered in terms of:

- individual animals or populations of animals,
- economic entities (production facilities or companies), or
- geographic regions (counties, states, countries, or continents), thus facilitating compartmentalization for trade purposes.

Biosecurity addresses strategies for both disease prevention (elimination / eradication) and management (limiting the consequence of infection).

Benefits - include optimized animal health and welfare and, in the case of food animal medicine, improved productivity and end-product value, as well as safe regional/international trade.

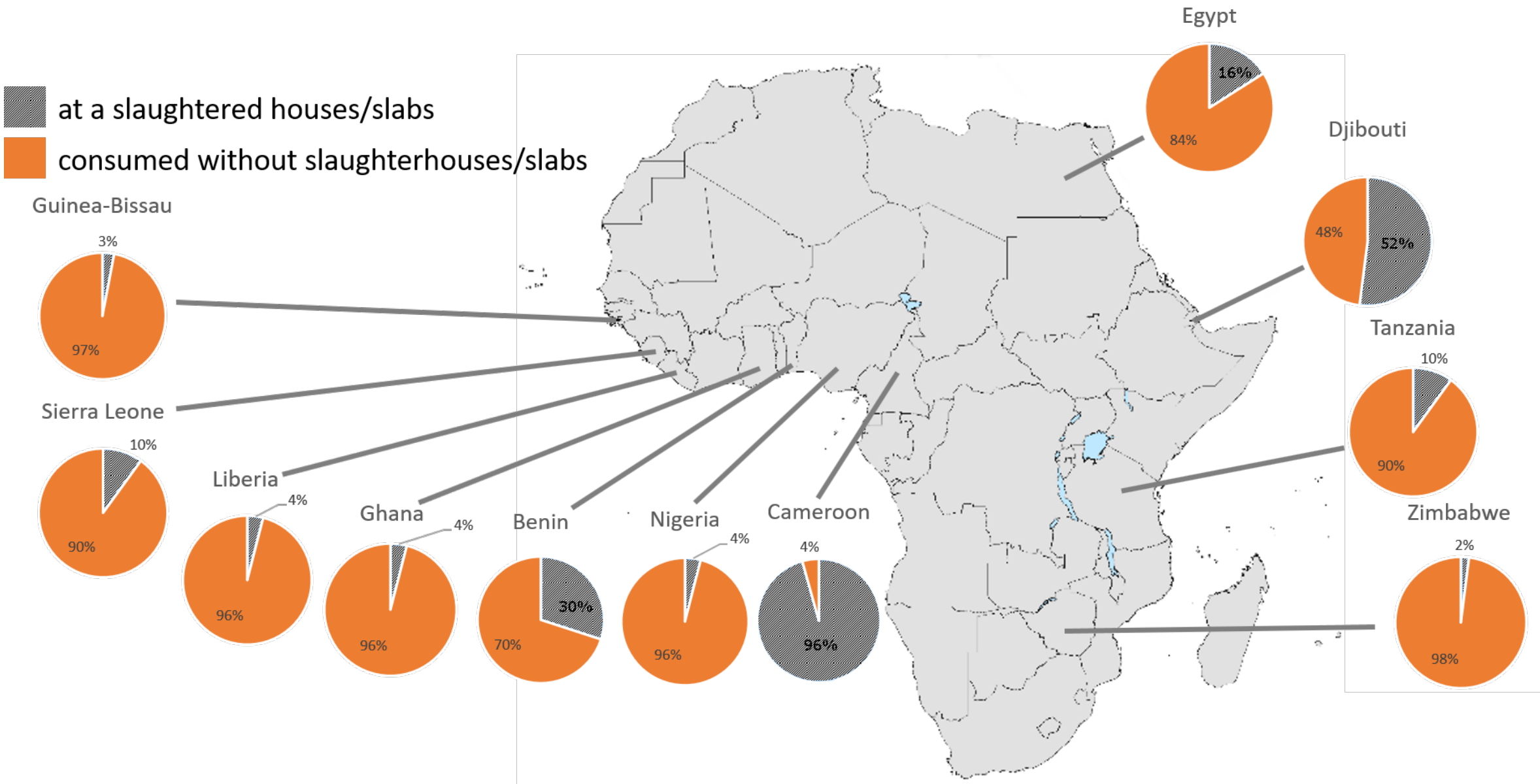
Although implementation of a comprehensive biosecurity plan or program has obvious benefits, allocation of resources must be economically (food animals) or emotionally (companion animals) justified.

Unless a disease poses a specific risk to human health or animal welfare, its mere presence in an individual animal or population of animals is not significant. Intervention strategies are consequently chosen based on both their economic and biologic efficiency.

A dynamic and integrated **epidemiologic and economic analysis** is required to determine and quantify the negative effect of a disease challenge, and the anticipated positive response to the proposed intervention strategy.

Rate estimate of sheep and goats slaughtered at slaughter houses / slabs

N.B. Since herd turnover of sheep and goats is approx. 3 – 4 years normally in Africa, the above rates were estimated as:
= Number of sheep and goats in official slaughter record / (total population and import of sheep and goats of the country / 4)



To illustrate regulatory oversight – this example of slaughter facilities for goats and sheep. Orange reflects no inspection at time of slaughter and blue with the facilities of an abattoirs (…. Do not know the quality of the inspection, but brings a special point:

If the AMR threat is a concern for the consumer, then we are too late in prevention.

Species	Number (head/hive)	% in the world total
Goats	387,667,193	39%
Sheep	351,579,045	30%
Cattle	324,844,768	22%
Camels	24,084,277	85%
Chickens	1,903,550,000	8%
Beehives	17,299,123	19%

- Depicts the number of sheep and goats that go through an abattoir
    - What quality of abattoir? Veterinary inspector? Level of training?
    - We are here to address the threat of AMR and in the USA's Action Plan on AMR, there is a fifth component that reaches out to the international community:
    - Travel, extensive food chains, imports, cultural ties to countries of origin, or solidarity to global issues makes surveillance and improving food systems an important concern
    - However, if AMR is a food safety and consumer problem, we have not properly addressed the underlining need to invest in prevention of diseases, including food bore pathogens
    - This is a transboundary issue:
        - My flight yesterday – less than 10 hours ago - had on layover and had I been at my programmed meeting in an east Asia country, I would have been in this capital city after being exposed to less than an ideal health care system or safe(r) food.

Meat stand in **Côte d'Ivoire**

Liberia : Road conditions can prevent access to field, especially during rainy season

Success story : Implementation of designated meat transport crate in **Kenya** has reduced contamination (illegal to transport meat without it)

Mali : Intensive chicken farming

Liberia – boy cleans sheep next to slaughterhouse prior to sale

Some pictures to highlight constraints on biosecurity and biosafety

- A local butcher in CdI
- Roadways that make access to health services difficult or where infrastructure for cold chain, electricity is not existent
- Exposure to potential zoonotic diseases because of proximity in husbandry practices and family life. Women and children are especially vulnerable
- Lack of sufficient veterinary inspectors in the field, and veterinary systems severely out of sync with needs
- FMD a highly infectious viral disease of ruminants and pigs (as well as wildlife). We estimate some 250 million cases / year. Treatments? An owner may provide what he/she has available – many times antibiotics. Vaccines not accessible (relatively expensive),

Reality

Infrastructure – shelter

Mixed farming – disease spillover - *Haemonchus*, FMD, *Salmonella*

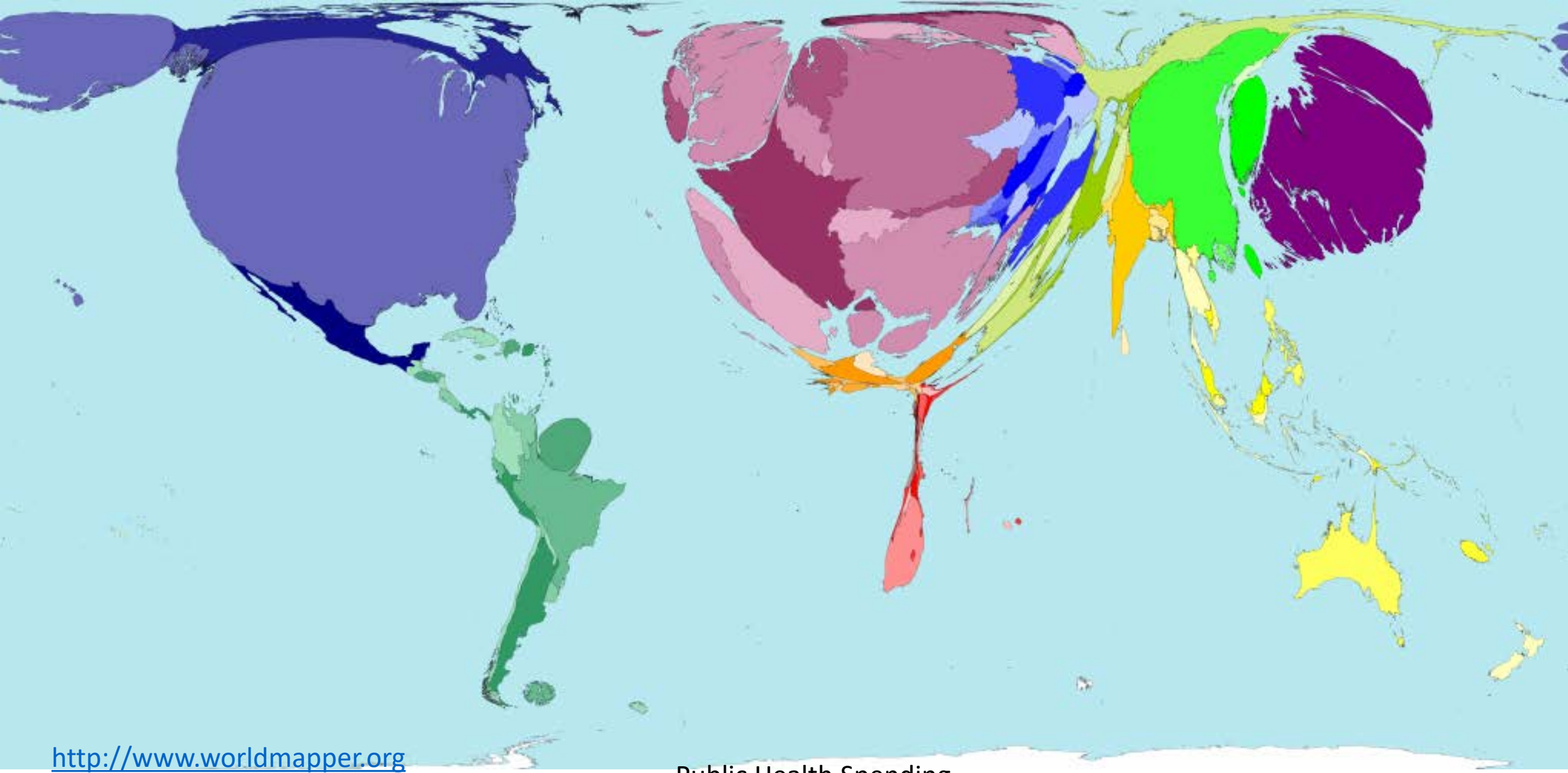
Quality or substandard biologicals, antibiotics

Disease burdens

Vaccination programmes

Qualified personnel

Access to veterinary extension services



http://www.worldmapper.org

Public Health Spending

Country spending for public health is inversely proportional to where we see the most disease burdens in populations – human and animals, bacterial, viral, fungal, parasitic or arthropod pests that attack animals and crops.

- There are over 7 billion food consumers every day; and growing. Demands for food is also growing.
- As individuals become wealthier there is a trend to want to have more animal sourced foods in their diets, but production and regulatory systems do not keep pace.
- Global systems in health care and disease prevention - IPC or biosecurity – mirror the imbalance

Realities – Africa (and elsewhere)

CONTEXT – disease management, containment, elimination

- ***Germ Theory***
- **Communication -** Cost and Benefits
- **Remoteness** of areas limit communities **access** to proper facilities
- **Few livestock agents / extension services** in the field to cover designated areas
- **Agents with limited training, supplies, infrastructure to properly perform**
  - Transportation (vehicles, gasoline); Supplies; Infrastructure (quarantine areas, livestock agents offices)
- **Dependency on external resources**

IMPACT

- Poor biosecurity, disease movements
- Limited capacity to investigate and report
- Donor-based funding help build capacity but **not sustainable** when projects end

NEEDS

- Novel approaches in financing and incentives
- Partnerships between sectors and producers
- Invest in extension
- Invest in prevention

- Adapted from findings of 13 SET missions (FAO) – although they **refer to surveillance systems**, these challenges **also impact biosecurity measures in the field**
- Countries : Tanzania, Liberia, Sierra Leone, Kenya, Côte d'Ivoire, Senegal, Mali, Uganda, Burkina Faso, Guinea, DRC, Cameroon, Ethiopia

Enhancing biosecurity a
chains to control and
Michel Dioné, Noeline Nantima

Summary

FOOD AND AGRICULTURE ORGANISATION
OF
THE UNITED NATIONS

Strategies for the Prevention and Control of Infectious Diseases (including Highly Pathogenic Avian Influenza) in Eastern Africa

GOOD BIOSECURITY PRACTICES
IN NON INTEGRATED COMMERCIAL AND IN SCAVENGING
PRODUCTION SYSTEMS
IN TANZANIA

Brief
1

a's pig value
wine fever

Veterinary Infectious Diseases

crobial Resistance: Its
lance, Impact, and
ive Management
s in Dairy Animals

Namita Rokana, Mudit Chandra, Jatinder Paul

uction and Health

ammes | projects | resources

Evaluation for Action – FAO's s
tool (SET) is shaping projects

FAO A

guideli

E FOR
US ANIMAL DISEASES

AgSecure Africa Programme

AgSecure
Africa Programme

CHAIN APPROACH TO
ANIMAL DISEASES
RISK MANAGEMENT
Technical foundations and
framework for field application

CATTLE

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Protecting animals, preserving our future

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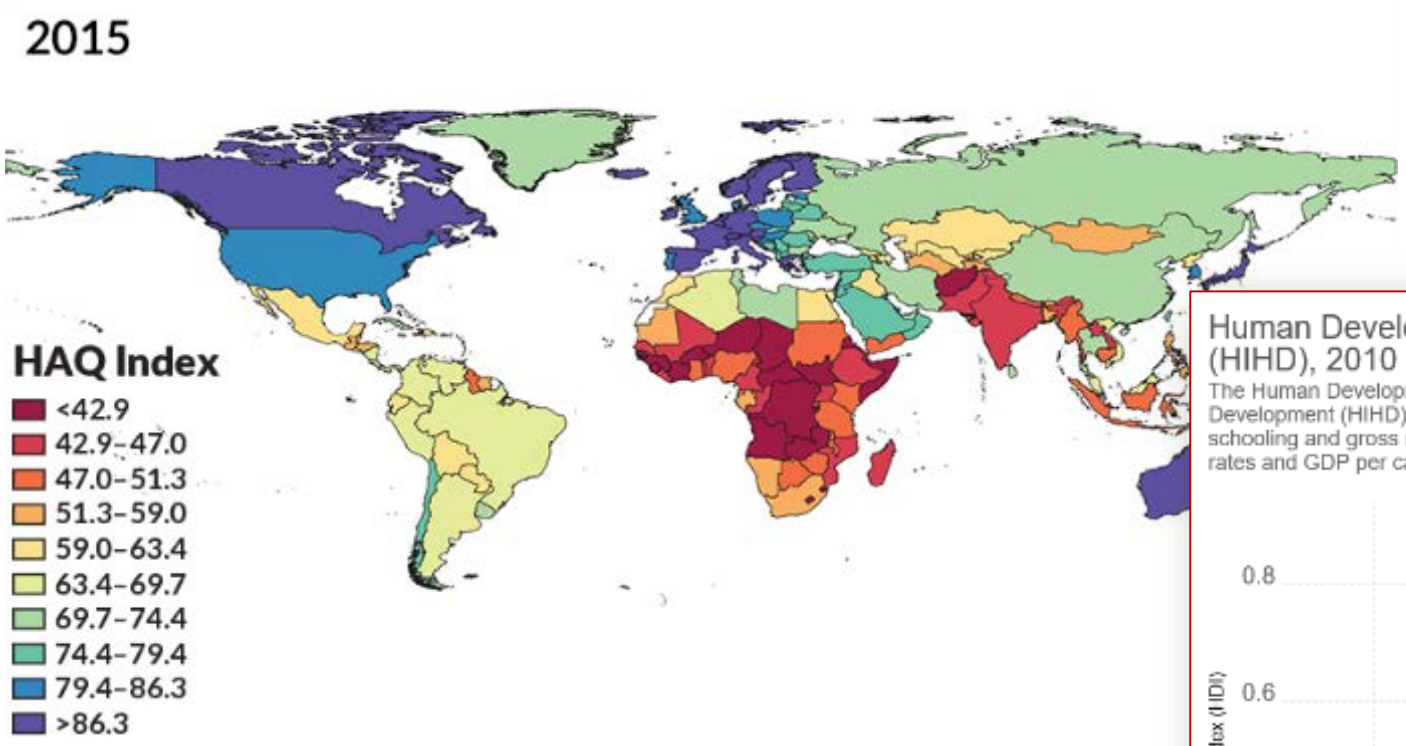
For the media
- OIE Photo Competition
- Infographics
- Press releases

Biosafety, Biosecurity and Prevention of Diseases

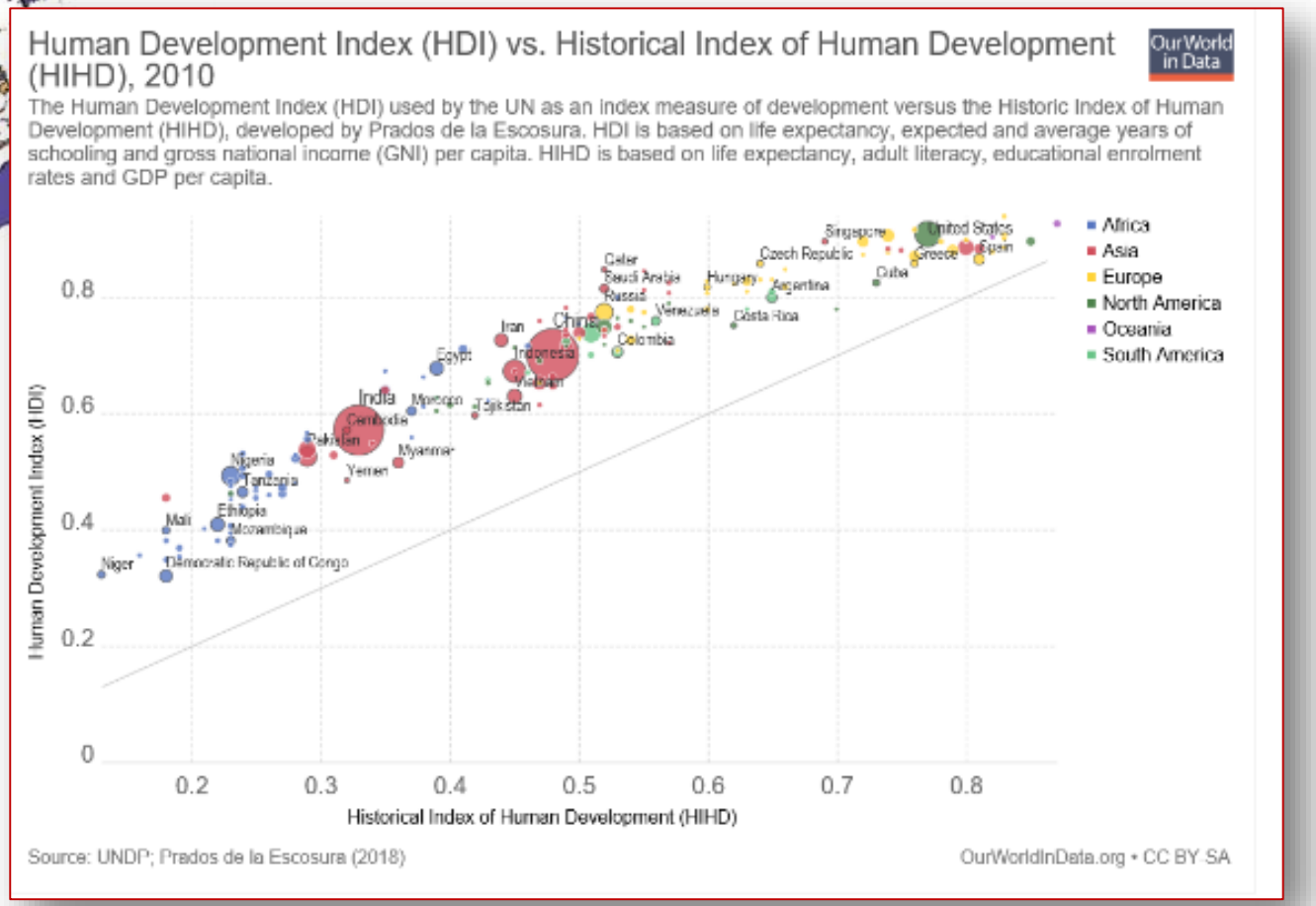
Some emerging or evolving infectious diseases have the potential to move quickly from local to international significance and to pass from animals to humans. The OIE has been actively engaged since its inauguration in the prevention and control of the spread of animal and zoonotic diseases.
Promoting transparency and understanding of the global animal disease situation, collecting, analysing and

We are great at providing guidance

- FAO
- OIE
- WHO
- Private sector
- Academia
- … All these need to face the realities mentioned



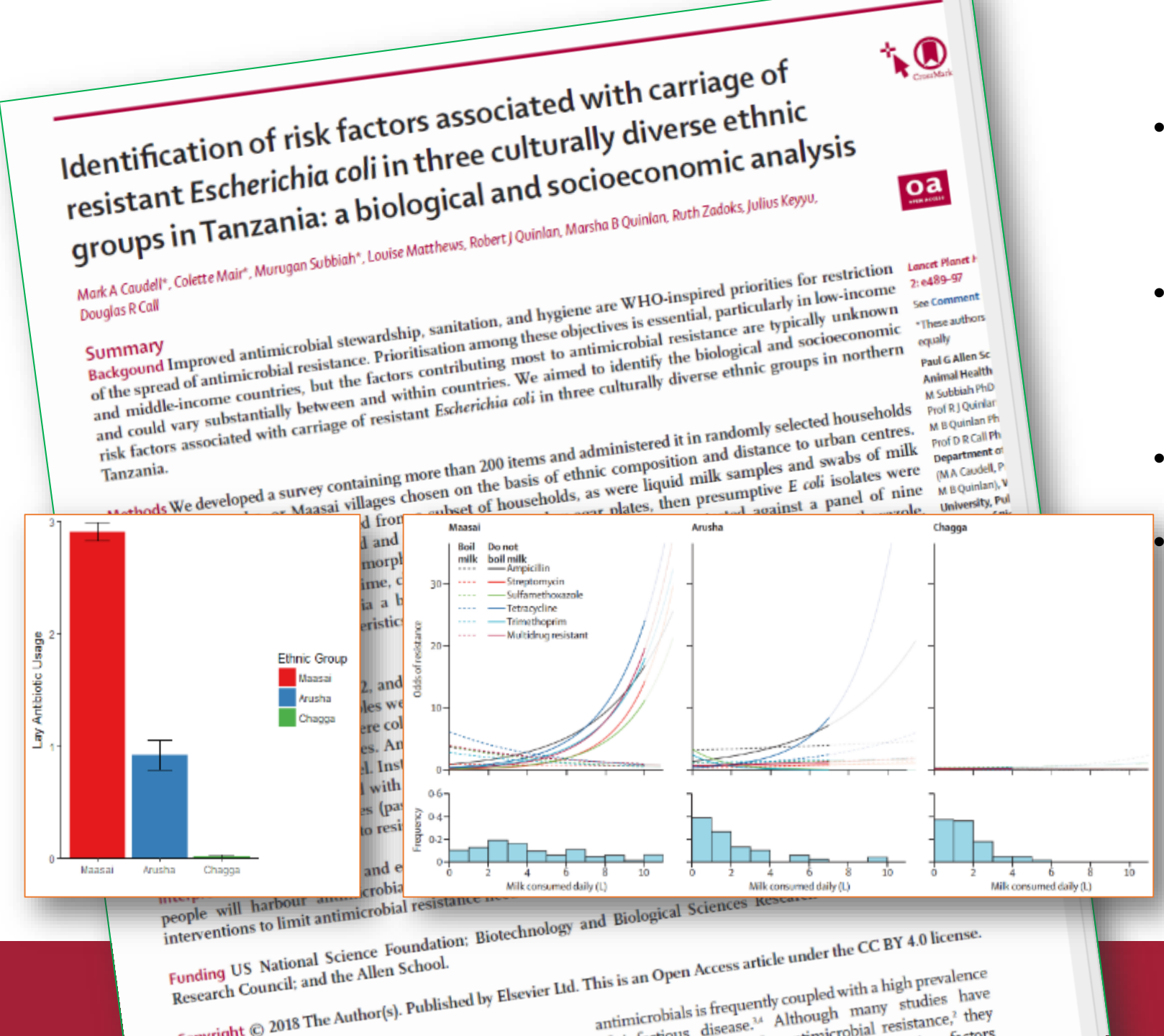
HEALTH CARE PALETTE Countries shaded with cooler hues had better health care quality and accessibility in 2015 than those with hotter colors.(Barber *et al*. *Lancet* 2017)



Human Development Indices HDI – Africa – used by UNDP

- Composite – life expectancy, education, wealth/income
- (developed by *Amartya Sen* and *Mahbub ul Haq* (1990))

HAQ – **Healthcare Access Quality** index – outcome of Global Burden of Diseases and Risk Factors Study 2016 – using 32 causes of death (considered avoidable if quality healthcare were available)



- **Antimicrobial use in people and livestock was not associated with prevalence of resistance at the household level**
- the dominant risk factor for AMR in the Maasai is consumption of raw milk and access to clean water, not AM use, nor AM use in animals.
- AMU was related to hygiene differences
- *"We point to it as a One-Health issue given promoting health in cows (cleaning udders, limiting mastitis, more prudent AB use) may ultimately decrease AMR in humans." (Pers. Comm.)*

This is an interesting paper from Mark Caudell (provided) on three native Tanzanian communities with different **practices and behaviours**, with different forms of access to veterinary products: The pastoralists Masai, Chagga, and the Arusha.

One major finding from the paper is that that the dominant risk factor for AMR in the Maasai (and somewhat Arusha but non sig [p=.08]) is consumption of raw milk.

The regression lines in the figure below show that households who had high resistance in humans tended to have higher resistance in the milk they consume (we conducted AST on milk samples as well). We point to it as a One-Health issue given promoting health in cows (cleaning udders, limiting mastitis, more prudent AB use) may ultimately decrease AMR in humans.

Food and Agriculture Organization of the United Nations

Top ten actions for farmers

to keep animals and people healthy and antimicrobials working

1 Clean often to get rid of the germs that make animals and people sick. Remember to **thoroughly wash your hands, shoes, and clothing** before and after contact with animals.

2 **Keep animal housing and outside areas that animals use clean** by clearing away manure and litter often. Waste from animals given antimicrobials needs to be handled more carefully.

3 **Reduce the risk of spreading germs.** Control who can come into contact with your animals and regularly clean farm equipment. When an animal gets sick, separate it from the rest of your animals to help prevent the infection from spreading.

4 **Practice "all-in and all-out" on your farm** to reduce the risk of new animals infecting the animals you already have. Breed animals at the same time, wean animals at the same time, and keep these groups of animals together at all stages of production. Clean and disinfect animal housing before new animals are introduced.

5 **Keep animal feed dry and stored safely** away from potential sources of germs such as rodents, birds, insects and other animals.

6 **Avoid stress for your animals.** Keep them comfortable and dry and make sure they have enough space. Let young animals feed from their mothers as long as possible before weaning because this helps to prevent infections.

7 **Help your animals stay healthy** and avoid getting sick by ensuring they have good nutrition. And keep animals healthy by making sure their water is clean.

8 **Vaccinate!** Ask your veterinary expert to help you administer important vaccines at the right times because **prevention is better than cure.**

9 **Seek veterinary expert advice to get the correct diagnosis and treatment** because buying and using the wrong treatment puts the health of you, your animals and your family at risk. Using the wrong antimicrobials is a waste of your time and money.

10 **Spread the word, not the germs!** Tell other farmers what you have learned because everyone needs to work together for cleaner farming to protect animal health, livelihoods, and the health of all people who depend on antimicrobials working when needed most.

Top ten actions for farmers to keep animals and people healthy and antimicrobials working

1. Clean often to get rid of the germs that make animals and people sick. Remember to thoroughly **wash your hands, shoes, and clothing before and after** contact with animals.

2. This is about "**Clean and cleaning"** It states: Keep animal housing and outside areas that animals use clean by clearing away manure and litter often. **Waste from** animals given antimicrobials needs to be handled more carefully.

3. Reduce the risk of spreading germs. **Control who can come in**to contact with your animals and regularly clean farm equipment. When an animal gets **sick, separate** it from the rest of your animals to help prevent the infection from spreading

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RESPONSIBLE USE
OF ANTIMICROBIALS IN AGRICULTURE
SAVES LIVES