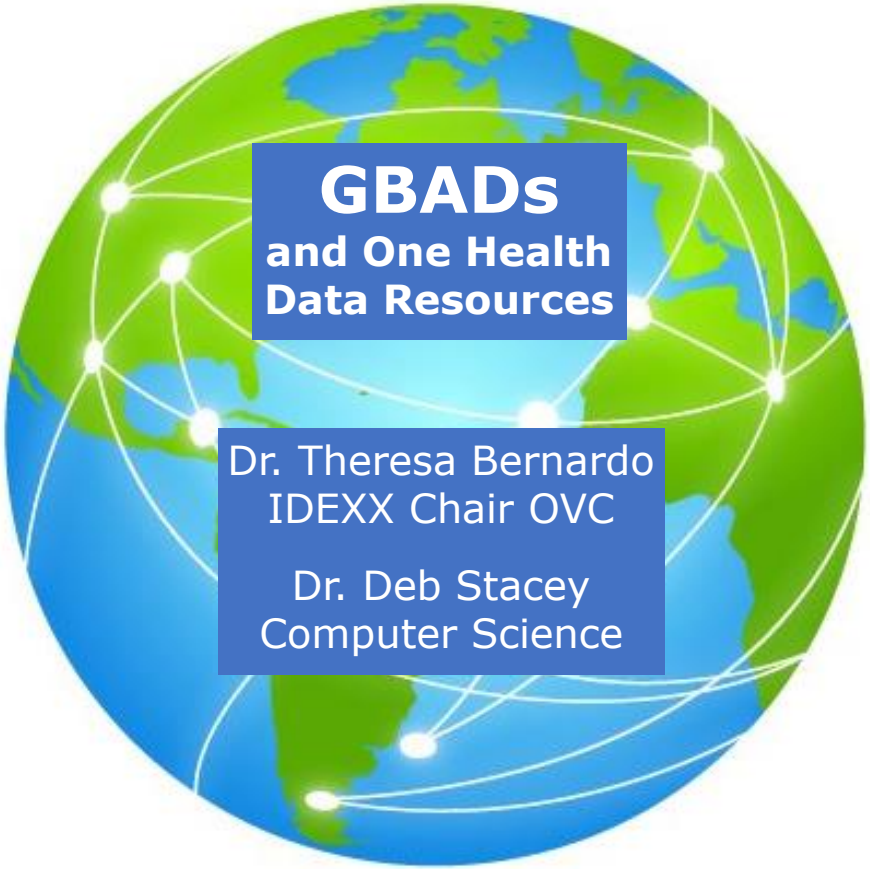

GBADs
and One Health Data Resources

Dr. Theresa Bernardo
IDEXX Chair OVC

Dr. Deb Stacey
Computer Science

https://animalhealthmetrics.org

UNIVERSITY of GUELPH
ONTARIO VETERINARY COLLEGE

UNIVERSITY of GUELPH
SCHOOL OF COMPUTER SCIENCE

GBADs

https://animalhealthmetrics.org

GBADs

Global Health Financing 2019

Total US$ 41 billion

Donor	Amount USD	% of Total	Per Capita	% of GDP
Canada	1.1 Billion	3	29 (CDN 38)	.06
US	12 Billion	30	37	.06
Gates Fdn	3.9 Billion	10		

Bill Gates: GBD ‘best chance of saving lives’

Publication Authors

Kelly Bienhoff

Research Manager

Publication date:

October 18, 2017

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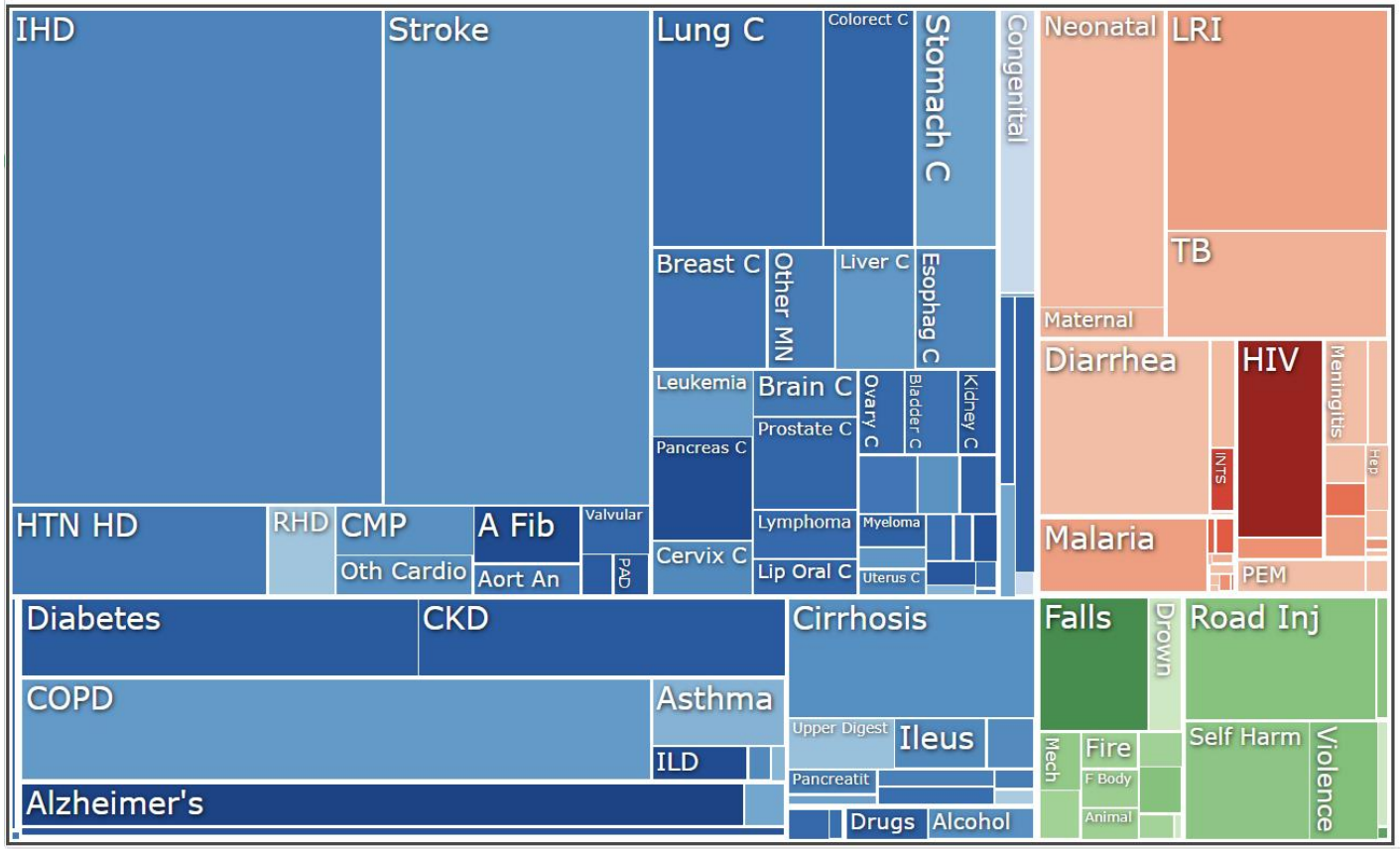
GBADs

What are people dying from?

Global Deaths 2019



Non-Communicable Infectious & Nutritional Trauma GBADs

PUBLIC RELEASE: 27-MAR-2018

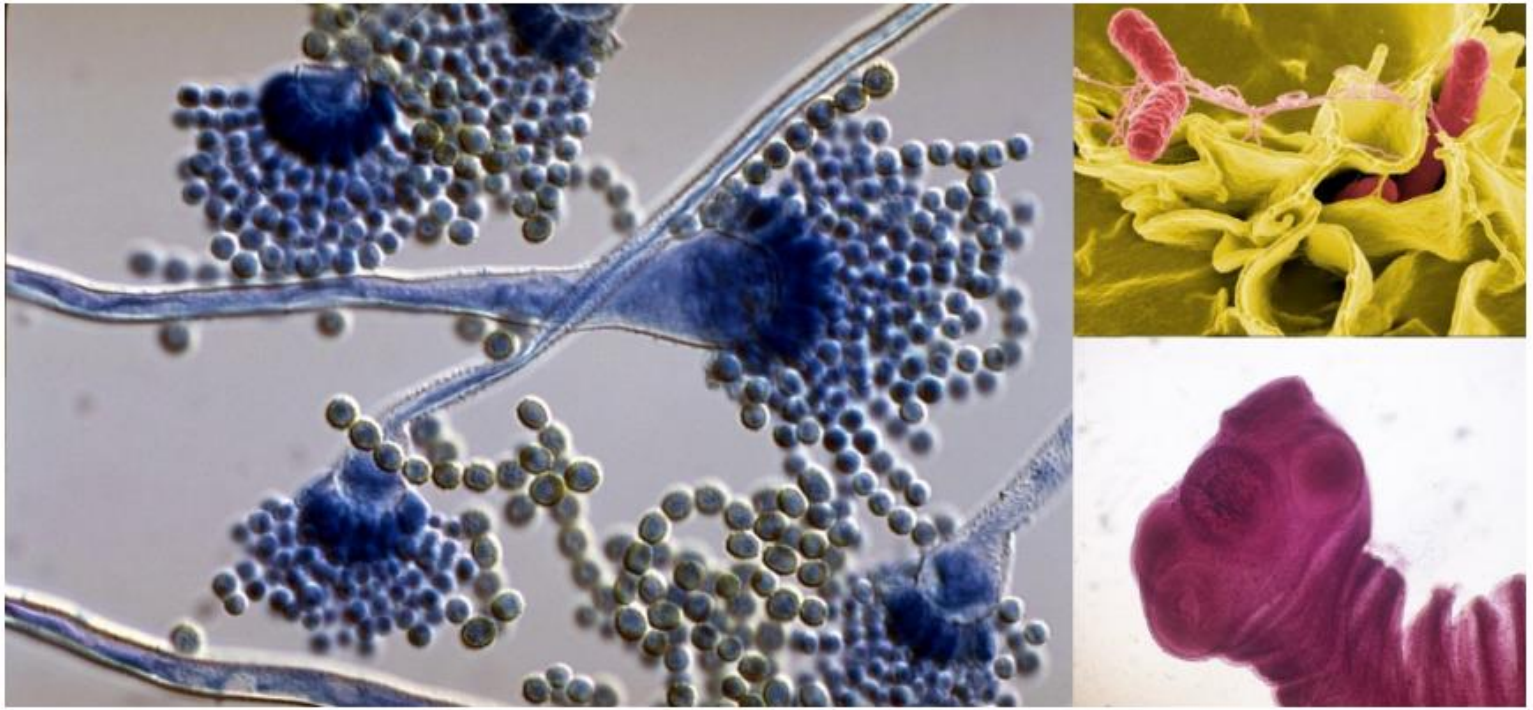
Founders of Global Burden of Disease study receive award for research excellence

INSTITUTE FOR HEALTH METRICS AND EVALUATION

PRINT E-MAIL

TORONTO - The co-founders of the groundbreaking Global Burden of Disease study (GBD), Professors Christopher Murray and Alan Lopez, have been selected for an international award honoring the "world's top scientists who have made outstanding achievements in global health research."

Since its launch over a quarter of a century ago, the GBD collaboration has generated nearly 20,000 peer-reviewed publications and has received more than 700,000 citations in scientific studies and reports.



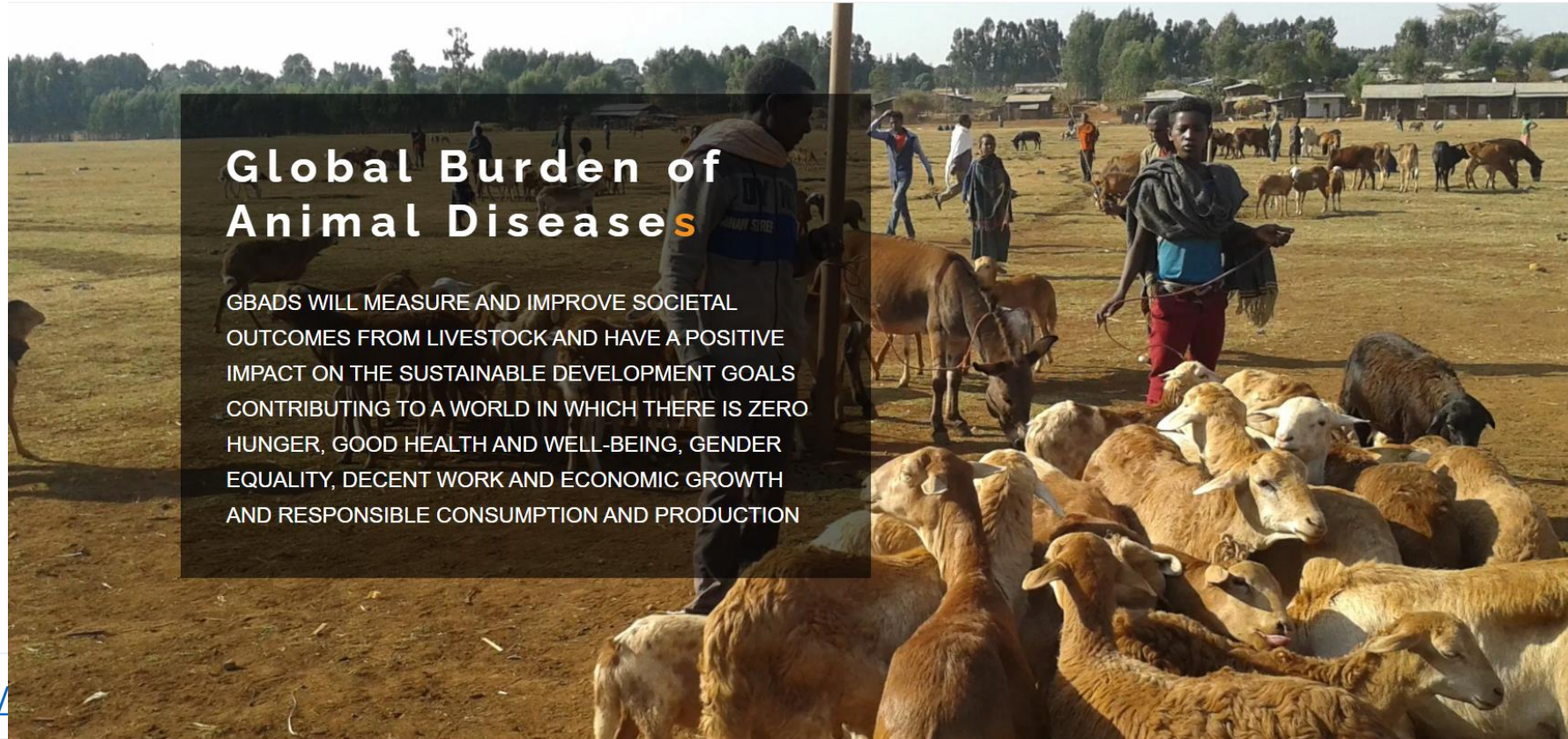
Reflections on the WHO Initiative to Estimate the Global Burden of Foodborne Diseases

https://animalhealthmetrics.org

GBADs

https://animalhealthmetrics.org

GBADs


GBADs
OUR NETWORK
OUR APPROACH
OUR PRODUCTS
NEWS/EVE
Global Burden of Animal Diseases
GBADS WILL MEASURE AND IMPROVE SOCIETAL OUTCOMES FROM LIVESTOCK AND HAVE A POSITIVE IMPACT ON THE SUSTAINABLE DEVELOPMENT GOALS CONTRIBUTING TO A WORLD IN WHICH THERE IS ZERO HUNGER, GOOD HEALTH AND WELL-BEING, GENDER EQUALITY, DECENT WORK AND ECONOMIC GROWTH AND RESPONSIBLE CONSUMPTION AND PRODUCTION

https:/

Internal Steering Committee
OIE, Programme Director, FAO, WB

Secretariat

Programme Manager (Huntington, UoL)
Project administrator (Davies, UoL)
OIE Technical Lead (OIE)
Finance, contracts and donor liaison officer (OIE)
M&E specialist (OIE)
Communication specialist (OIE)

Programme Directorate

Programme Director (Rushton, UoL)
Senior Analyst (UoL)
Review Panel: Havelaar, Shaw, Wood

Policy and Institutional Environment workstream

Executive Committee

Methods

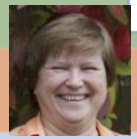
Population and Production Systems (Herrero, CSIRO supported by Robinson, FAO)

Production Loss & expenditure (Torgerson, Zurich & Shaw, independent)

Wider economic impacts (Marsh, WSU, Pendell, KSU)

Ontology & Attribution (Bruce, Murdoch)

Human Health (Devleesschauwer , Sciensano supported by Pigott, IHME)



Knowledge Engine

Informatics (Bernardo and Stacey, Guelph)

Capacity & Reach

Disease Prioritisation (Grace, ILRI)

Engagement (Watkins, independent; Kapur, Penn State; Peyre, CIRAD; Romero, IICA)

Ethiopia Case Study (Wieland, ILRI)

Education (TBC)

Country Case Study 2 (TBC)

Country Case Study 3 (TBC)

Aquatics Case Study (Reantaso, FAO)

Sector Case Study 2 (TBC)

GBADs

Informatics Working Group

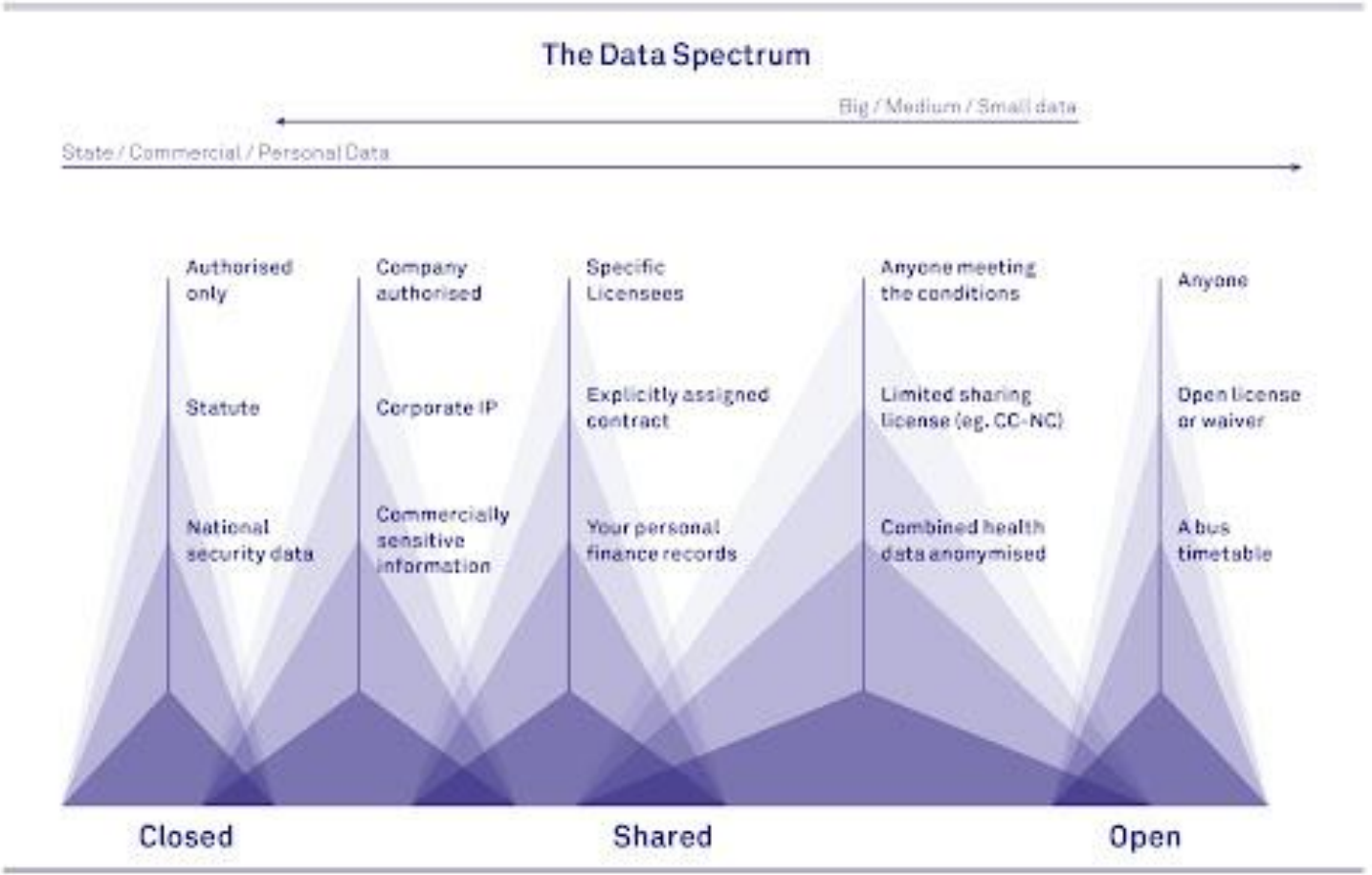
Informatics Working Group

Outputs

Year 1 1.5 Year 2 Year 3 Year 4 Year 5

2. Map landscape, quality & access for **existing data**

Informatics Working Group



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GBADs

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GBADs

COOP DREAMS

Why I would raise chickens

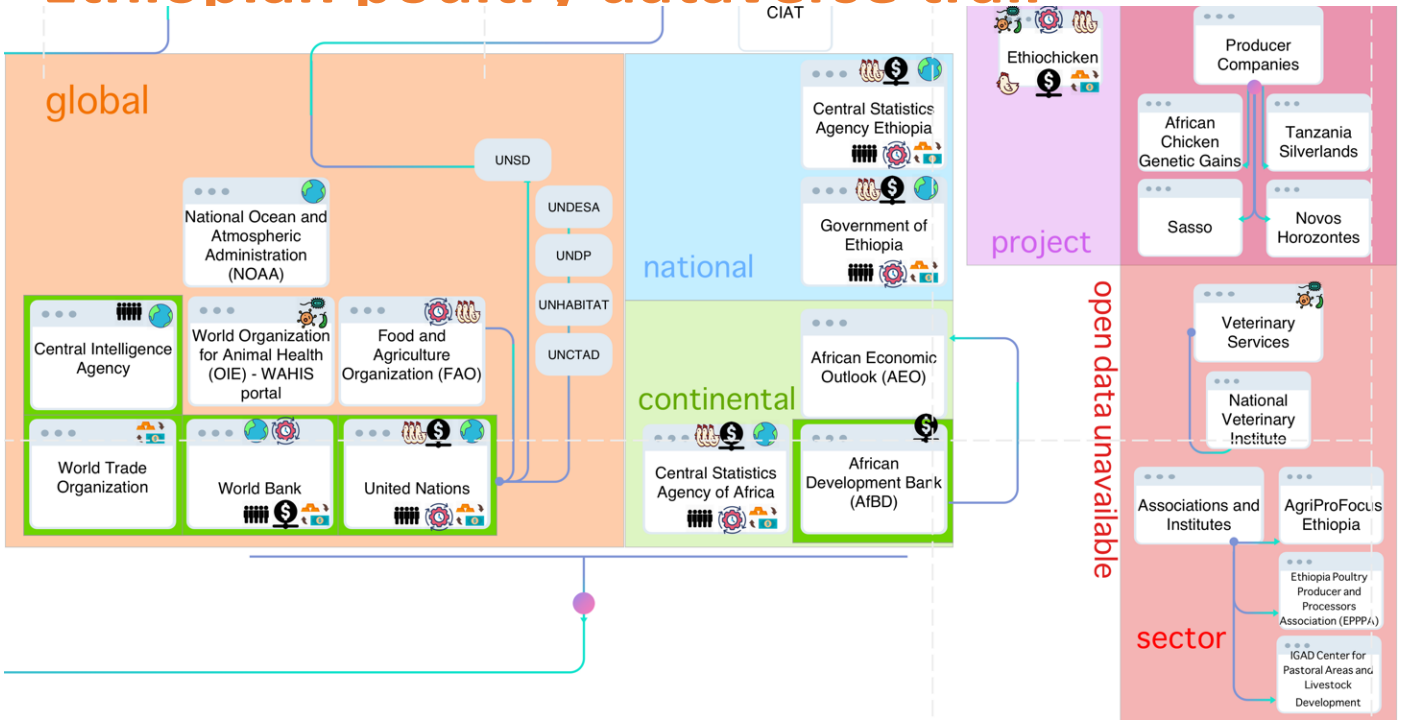
I'm excited about the poverty-fighting power of poultry.

By **Bill Gates** | June 07, 2016 • 3 minute read

646

If you were living on $2 a day, what would you do to improve your life?

Ethiopian poultry dataverse trail



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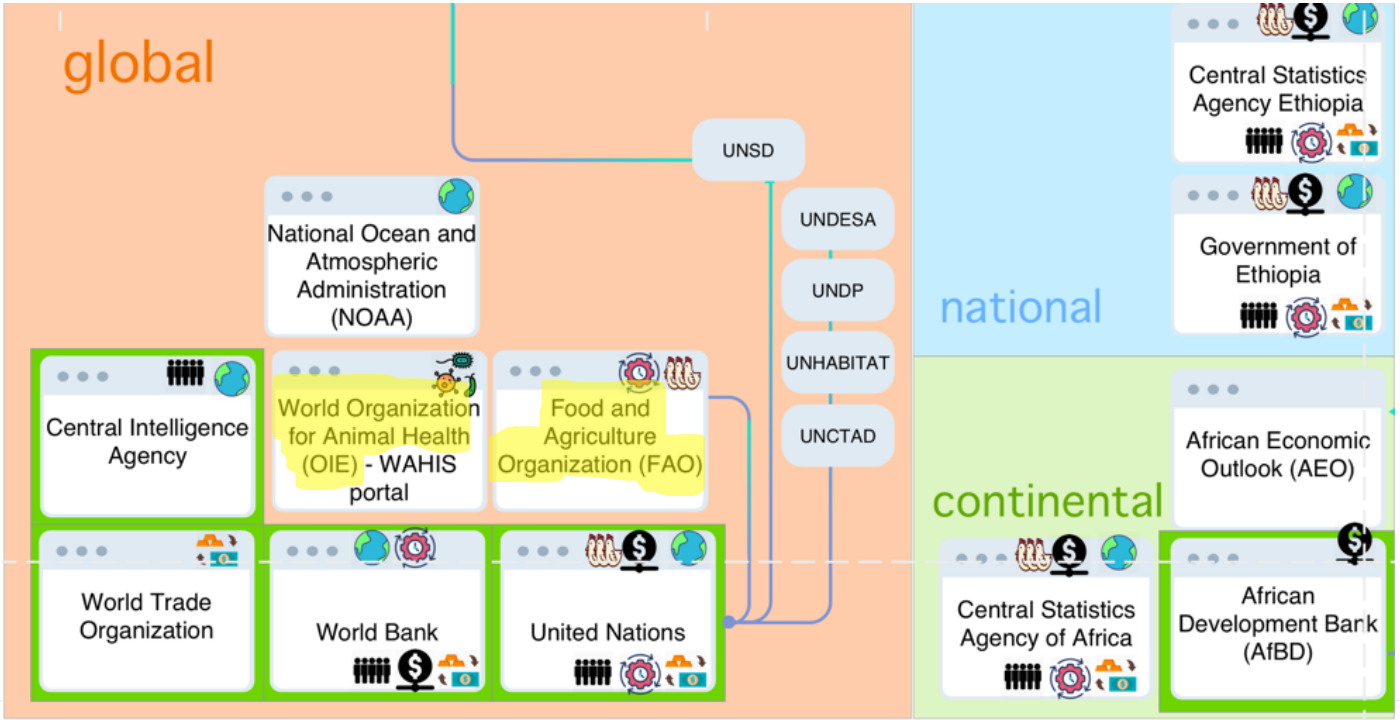
GBADs

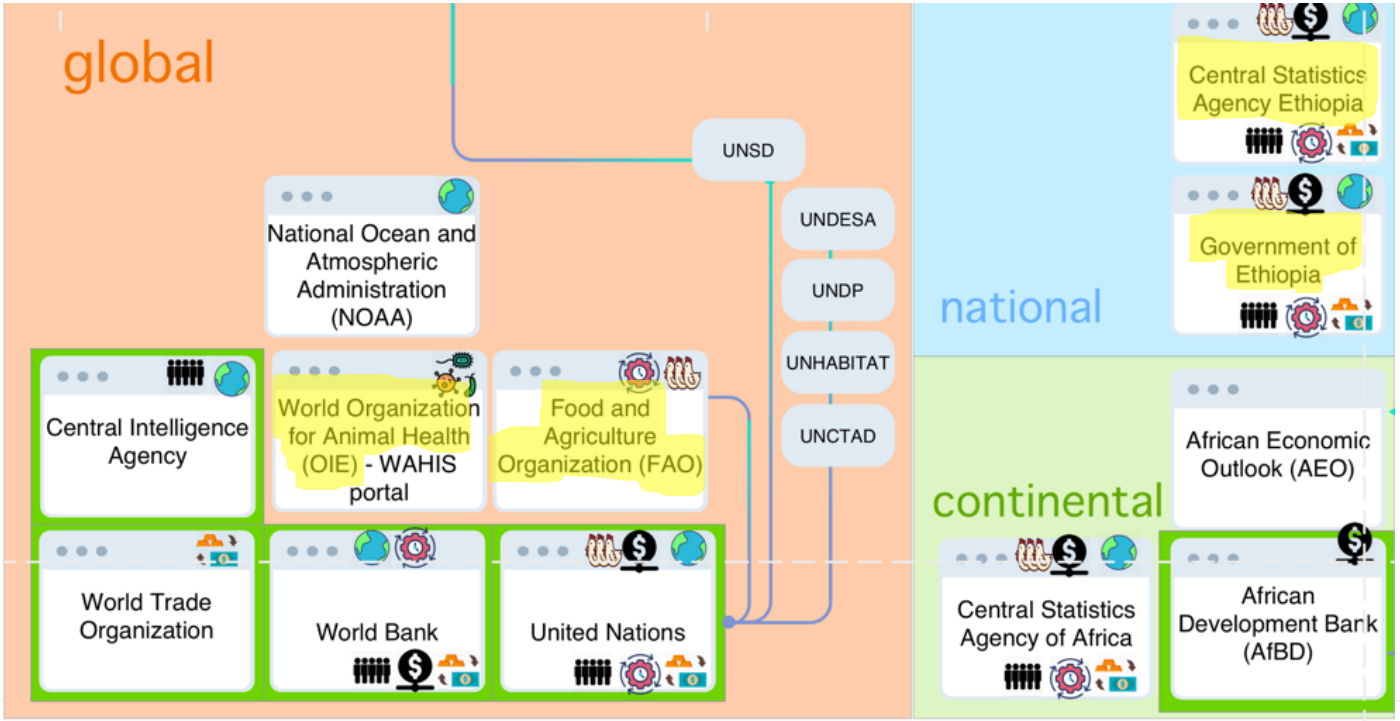
Ethiopian poultry dataverse trail



https://animalhealthmetrics.org

GBADs

Ethiopian poultry dataverse trail

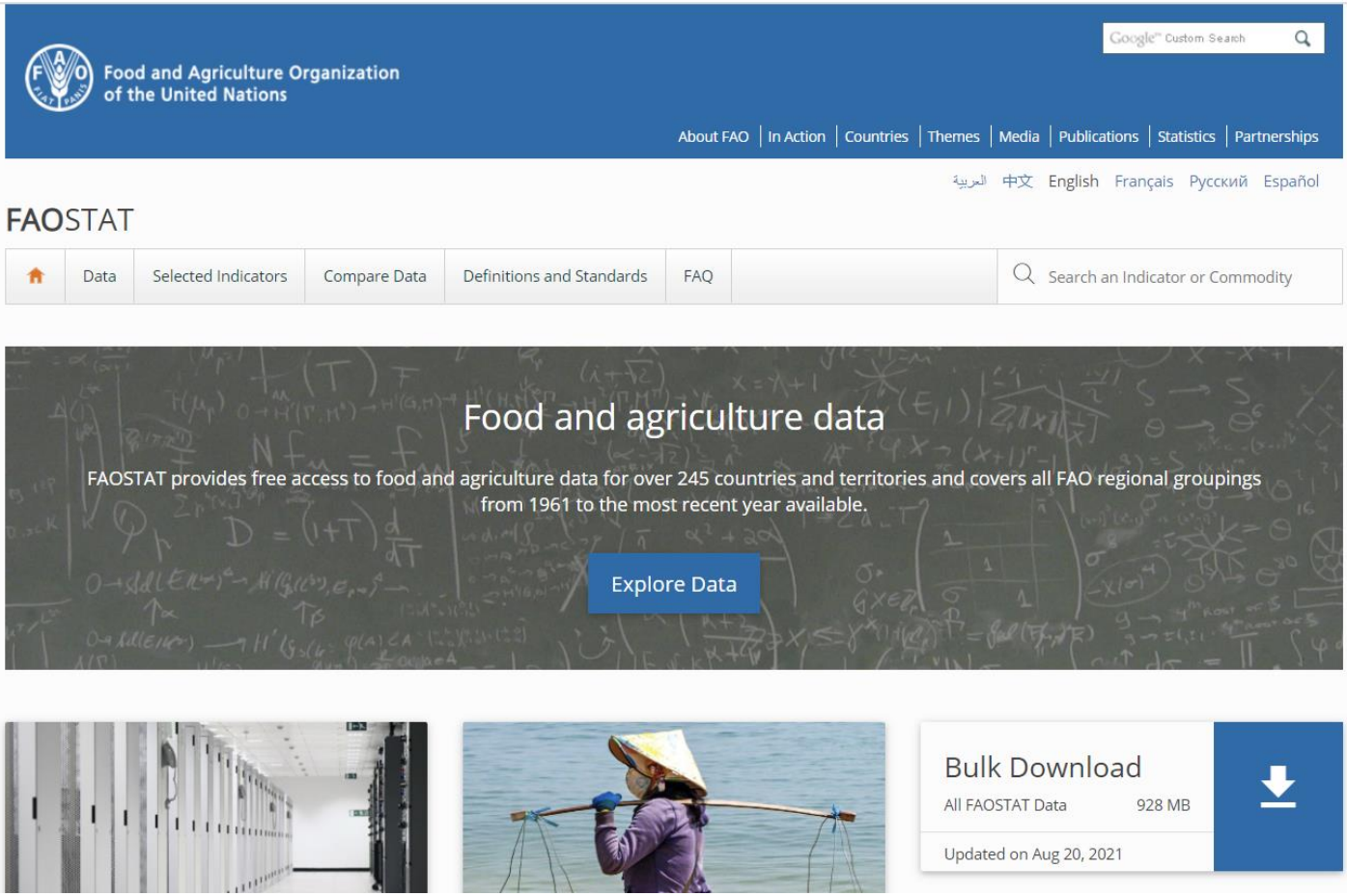


https://animalhealthmetrics.org

GBADs

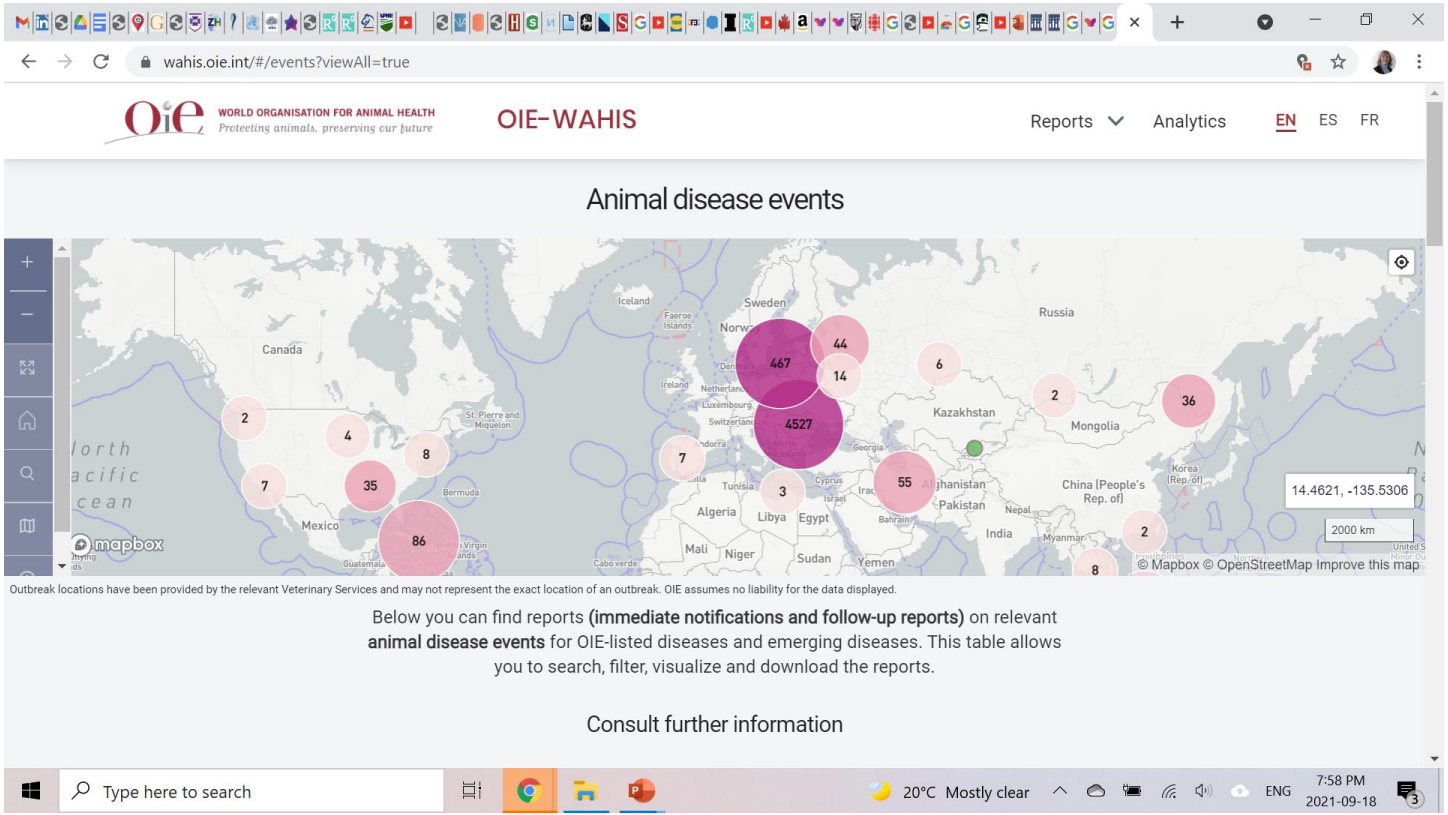
How do you get the data?

- Downloading files
- Scraping Websites
  - Data is only available on webpages
- APIs (Application Programming Interfaces)
  - Machine to machine communication



https://animalhealthmetrics.org

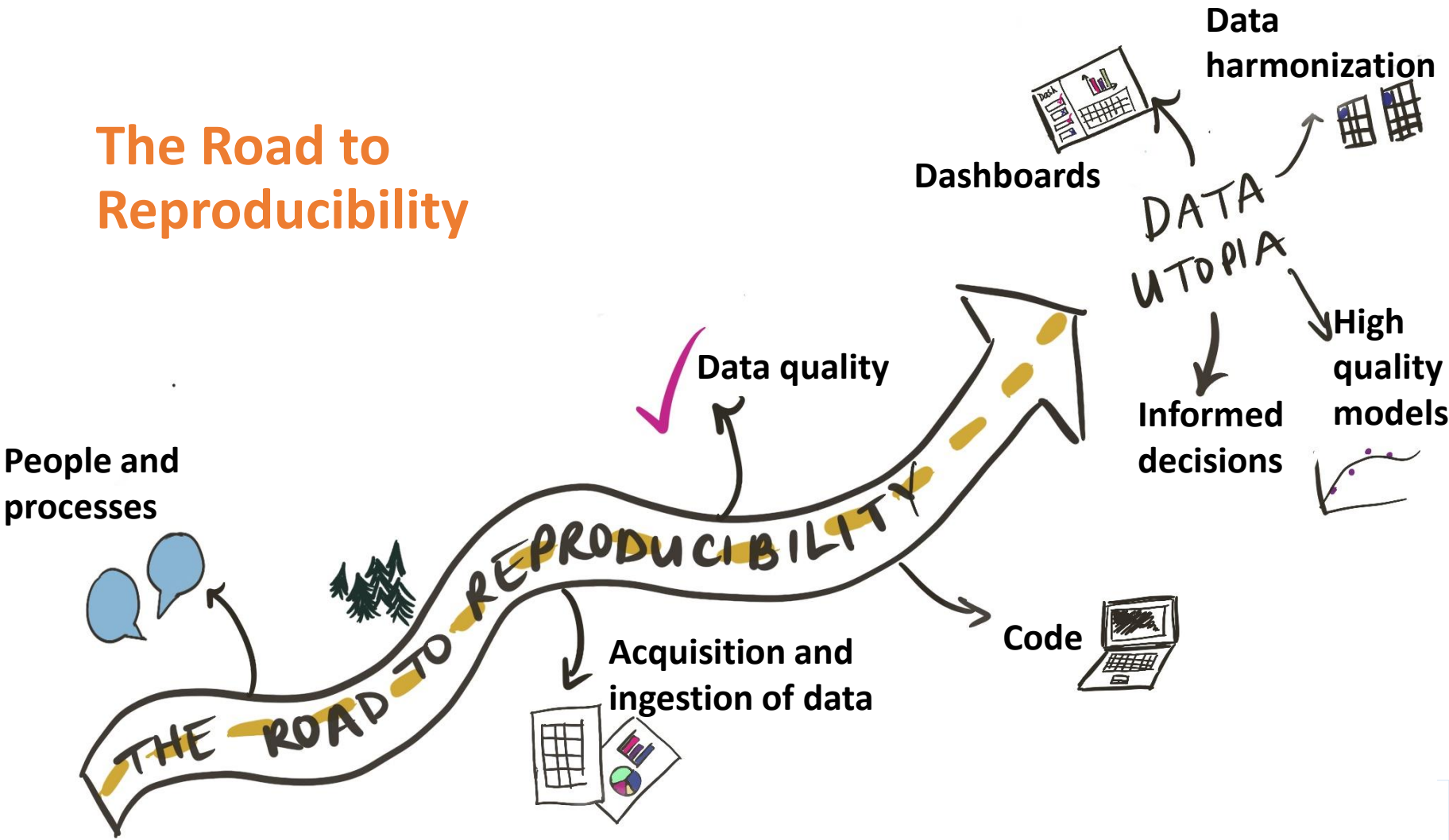
GBADs

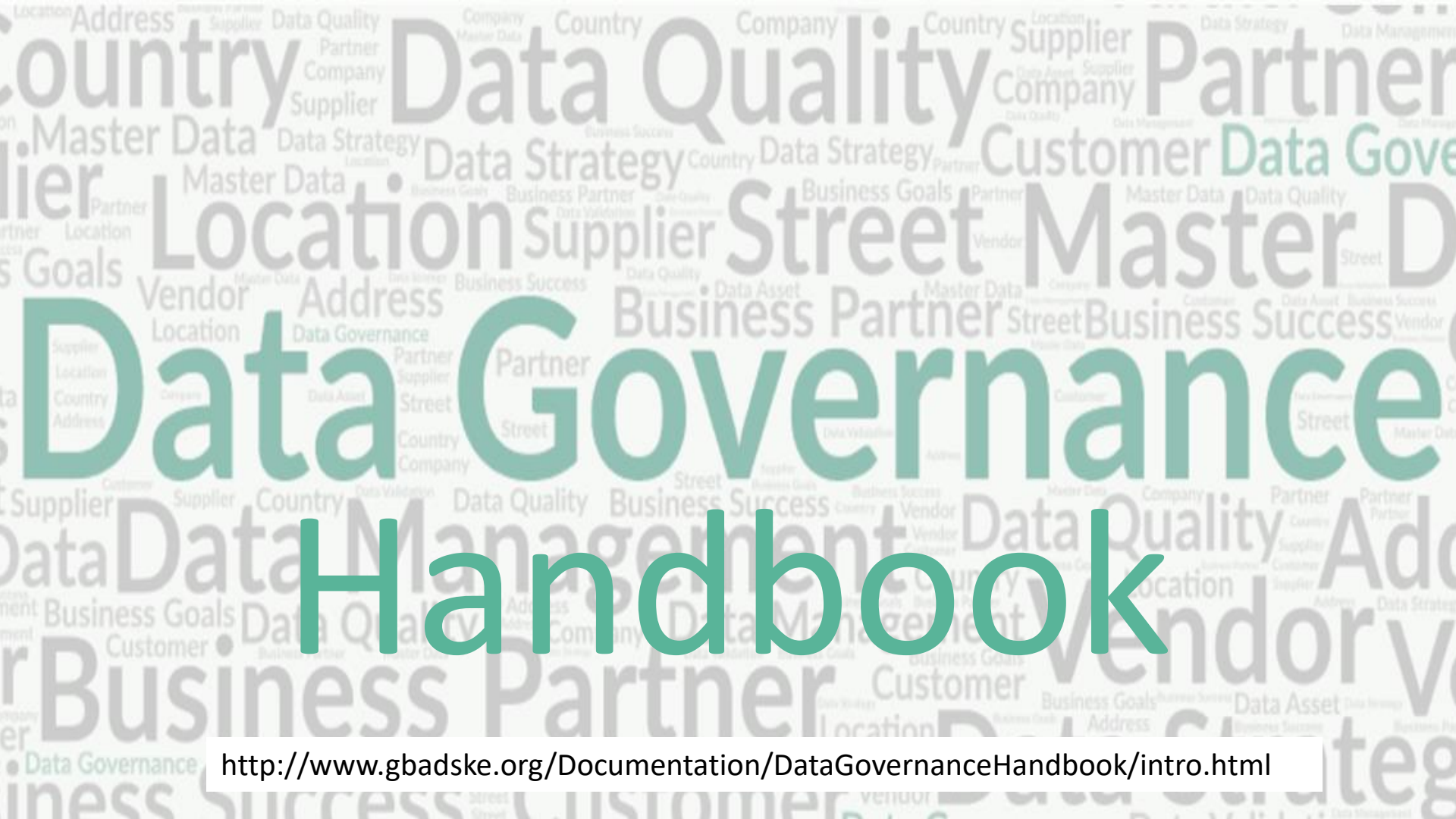


https://animalhealthmetrics.org

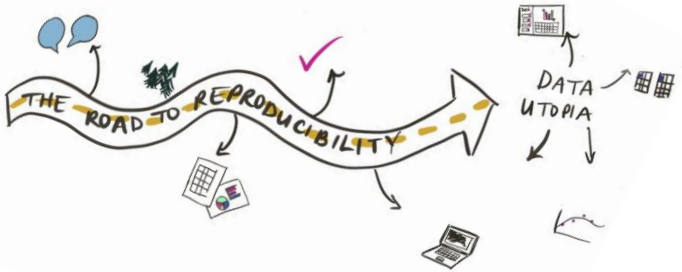
GBADs

The Road to Reproducibility



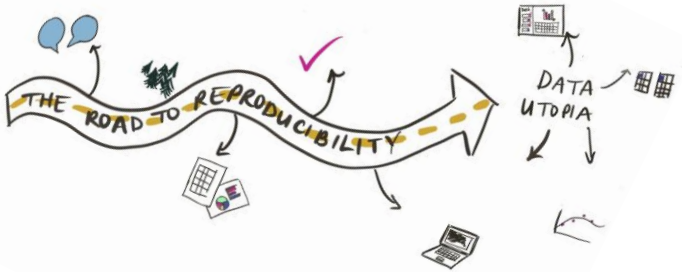

Data Governance
Handbook
http://www.gbadske.org/Documentation/DataGovernanceHandbook/intro.html

Informatics – Road to Reproducibility



1. Values and goals
2. Data and metadata quality
3. Data ingestion and acquisition
4. People and processes

Informatics – Road to Reproducibility



1. Values and goals
2. **Data and metadata quality**
   - **2.1. Data sources**
   - **2.2. Internal data quality assessment**
   - **2.3. External data quality assessment**
3. Data ingestion and acquisition
4. People and processes

2.2. Data Quality

"Data preparation accounts for about 80% of the work of data scientists"

- There are **MANY dimensions of data quality**.
- **Don't reinvent the wheel – we do the work so you don't have to!**

2.2. Internal data quality assessment

- **Internal data quality: WITHIN a single data source and/or provider, what is the quality of the data?**

- **Dimensions of internal data quality:**
  A. Accuracy
  B. Credibility
  C. Completeness
  D. Consistency
  E. Data format availability
  F. Longitudinal credibility

2.2. Internal data quality assessment: Dimensions of internal data quality

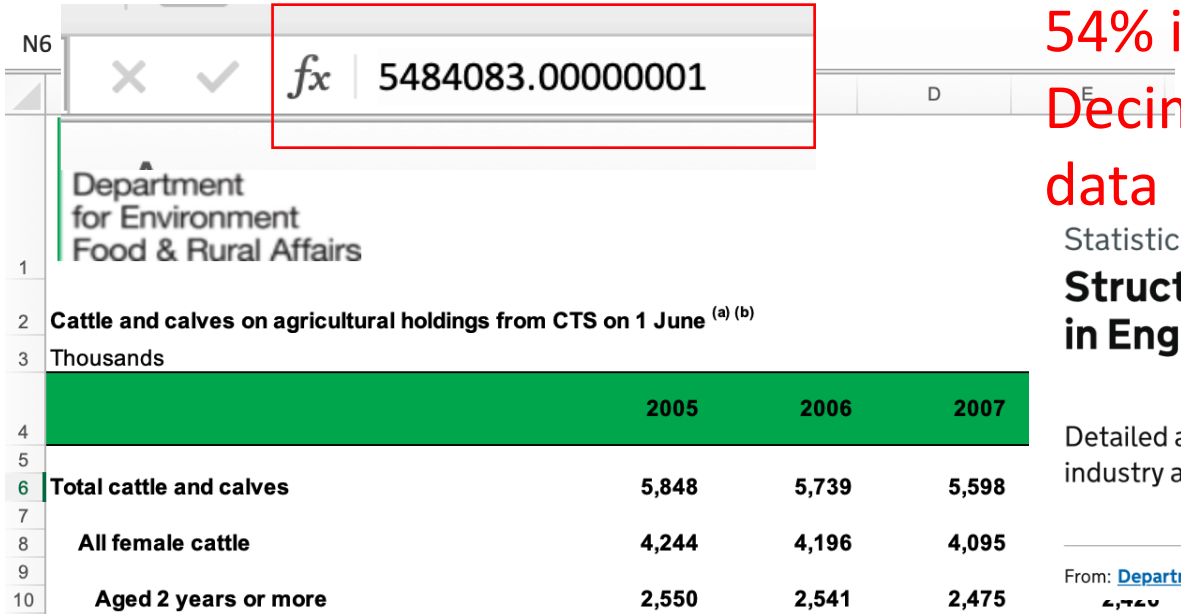
A. Accuracy: Do the data show realistic values and data types?

For example:

- Metadata reflect the content of the data
- Outliers in data are minimal, or when present are realistic
- **No floating-point numbers (decimals) in animal population numbers**

2.2. Internal data quality assessment: Dimensions of internal data quality

A. Accuracy: Do the data show realistic values and data types?



N6 | fx | 5484083.00000001

Department for Environment Food & Rural Affairs

Cattle and calves on agricultural holdings from CTS on 1 June [a] [b]

Thousands

	2005	2006	2007
Total cattle and calves	5,848	5,739	5,598
All female cattle	4,244	4,196	4,095
Aged 2 years or more	2,550	2,541	2,475

54% incorrect data type

Decimals for cattle population data

Statistical data set

Structure of the agricultural industry in England and the UK at June

Detailed annual statistics on the structure of the agricultural industry at 1 June in England and the UK.

From: Department for Environment, Food & Rural Affairs

Data Source: Department for Environment, Food and Rural Affairs, Government of the United Kingdom. (2021). *Statistical data set: Structure of the agricultural industry in England and the UK at June.* [Data file]. Retrieved September 13, 2021 from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/946266/structure-june-eng-series-22dec20.ods

2.2. Internal data quality assessment: Dimensions of internal data quality

C. Completeness:

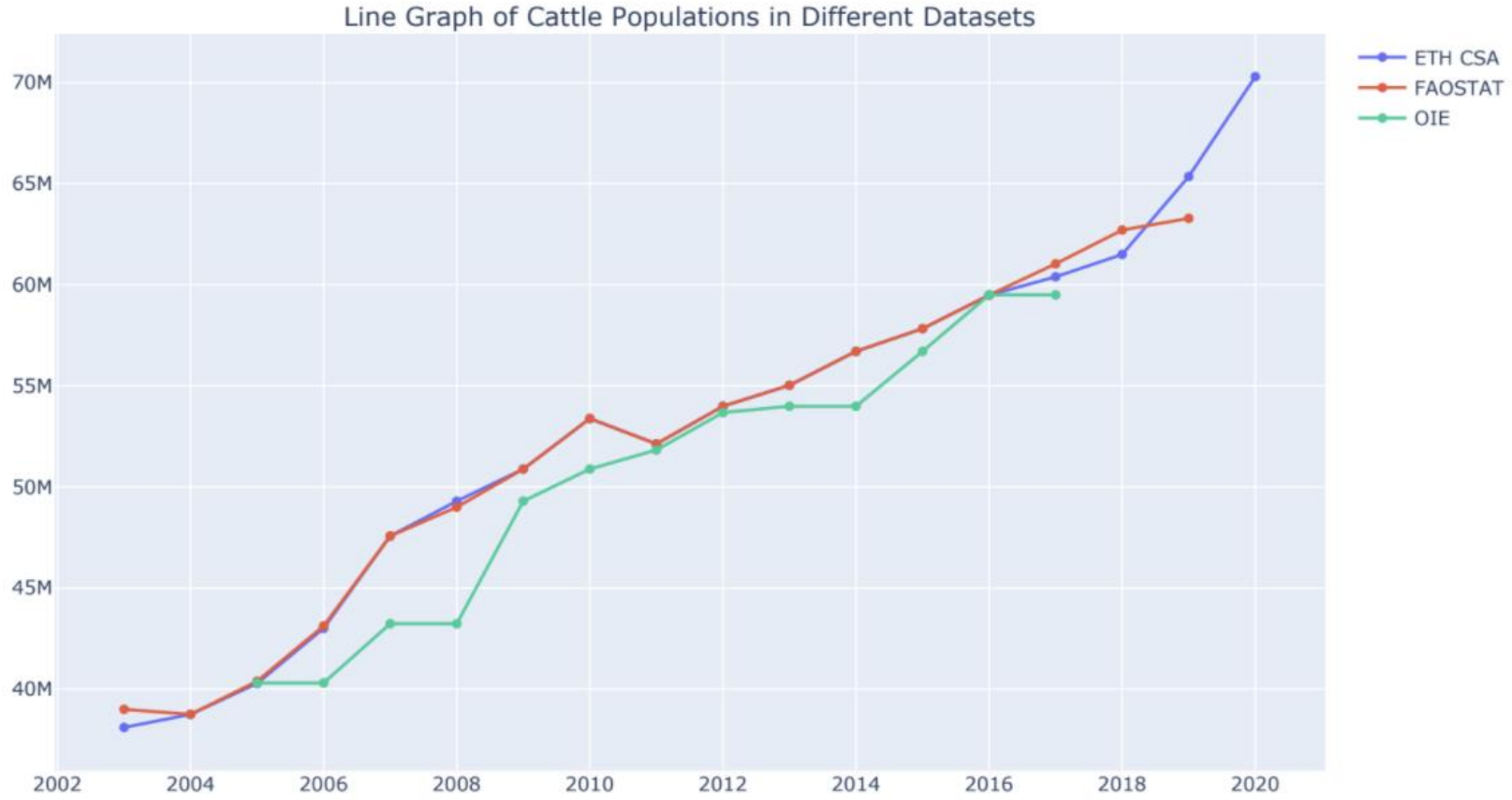
Does the data contain any missing or incomplete values? Is the **difference between uncollected/unknown and 0**, imputation etc. clear?

2.3. External data quality assessment

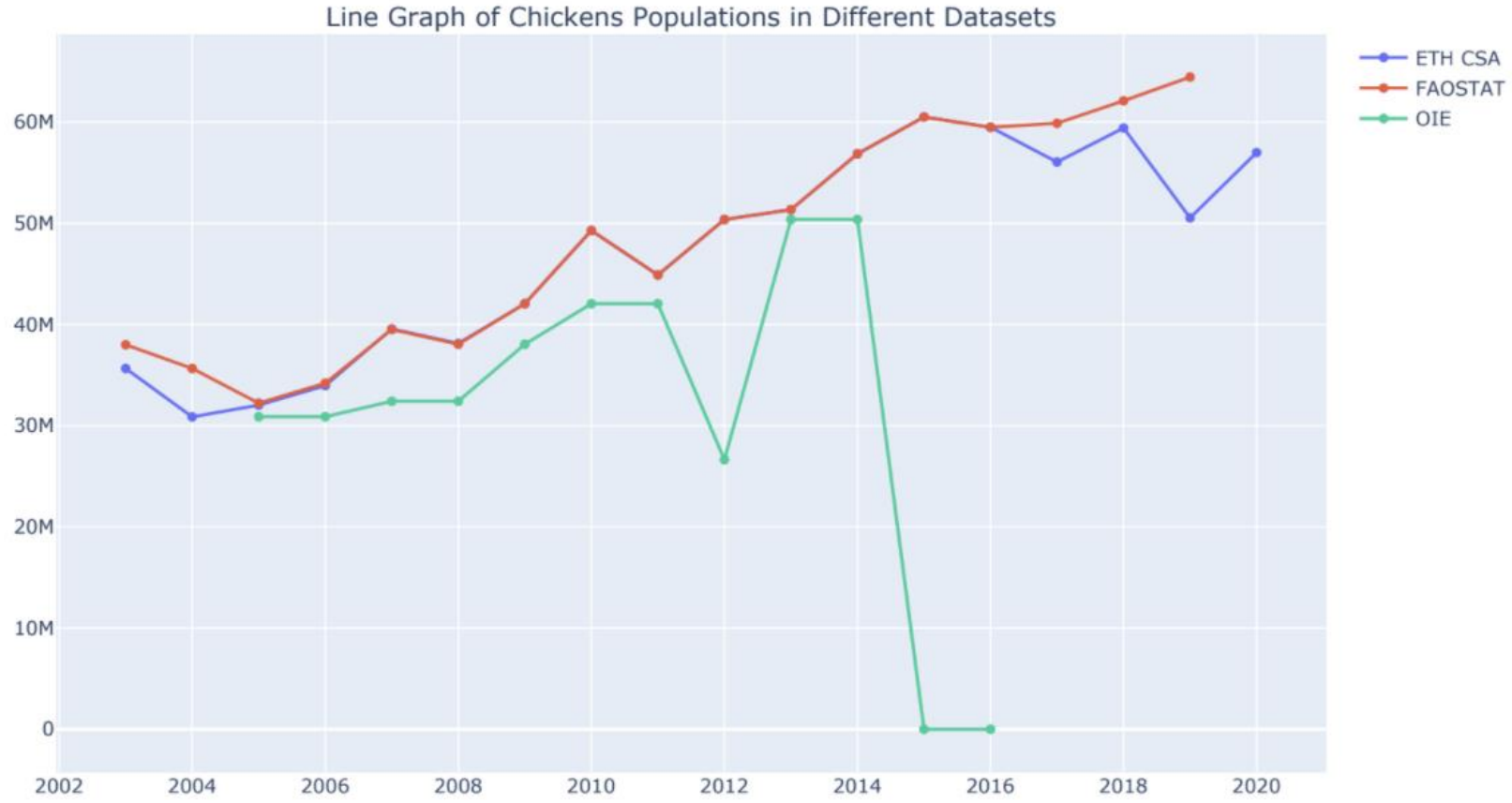
- **External data quality: What is the quality of the data BETWEEN different data sources?**

- **Agreeability:**
  - Do "same observations" from different sources report same number?
  - How do collection methods reporting same observations compare?
  - Are missing values consistent between data sources?

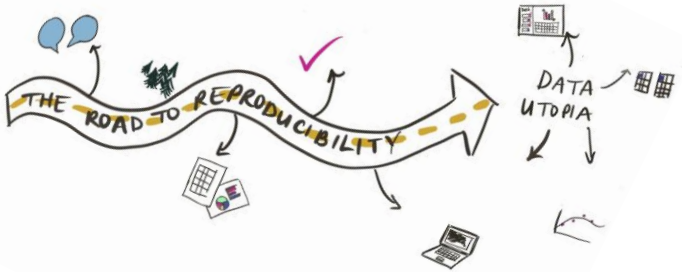
Data Quality Analysis: Population (ETH CSA, FAOSTAT, OIE)



Data Quality Analysis: Population (ETH CSA, FAOSTAT, OIE)



Informatics – Road to Reproducibility



1. Values and goals
2. Data and metadata quality
3. **Data ingestion and acquisition**
   - 3.1. Streamlining ingestion of data into GBADs
   - **3.2. Data licensing**
   - 3.3. Data provenance and citations
   - 3.4. Code: GBADs GitHub
4. People and processes

3.2. Data licensing

Personal contacts are not enough!

Image from: https://www.gida-global.org/care

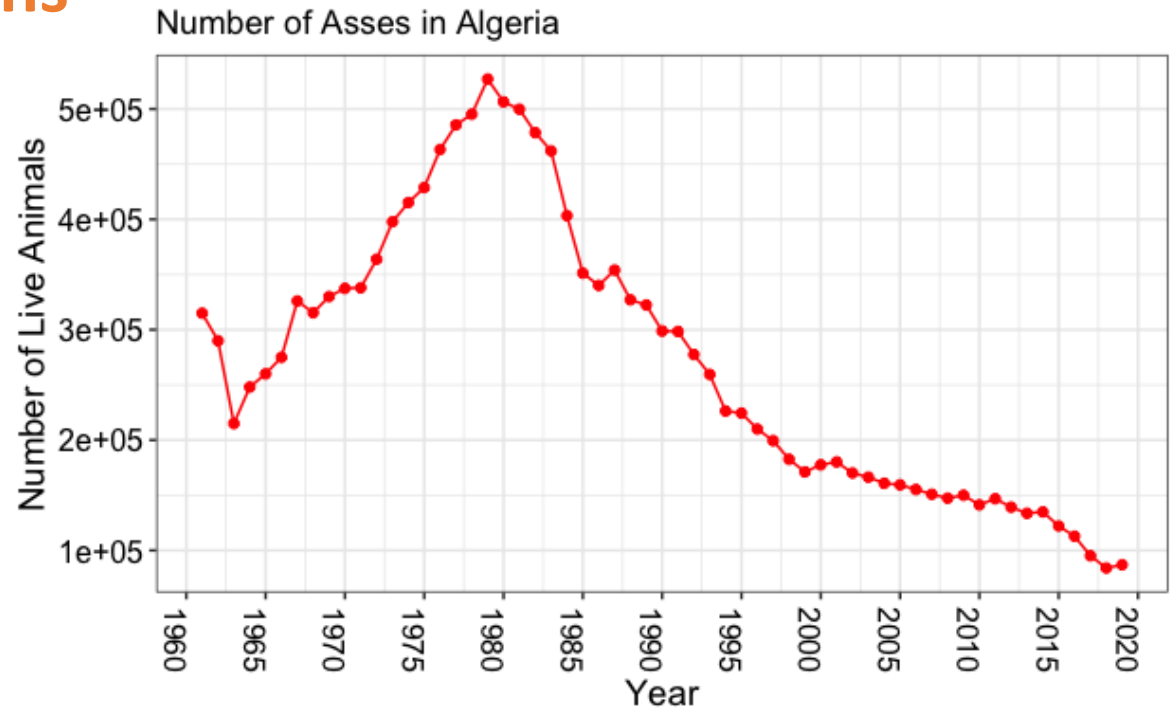
Purposes of data licensing:

1. Data licensing is often a legal requirement
2. Protect and respect data contributors (CARE principles)
3. Inform data users (who, how and when can you use the data?)
4. Inform system view (private data, group-access data)

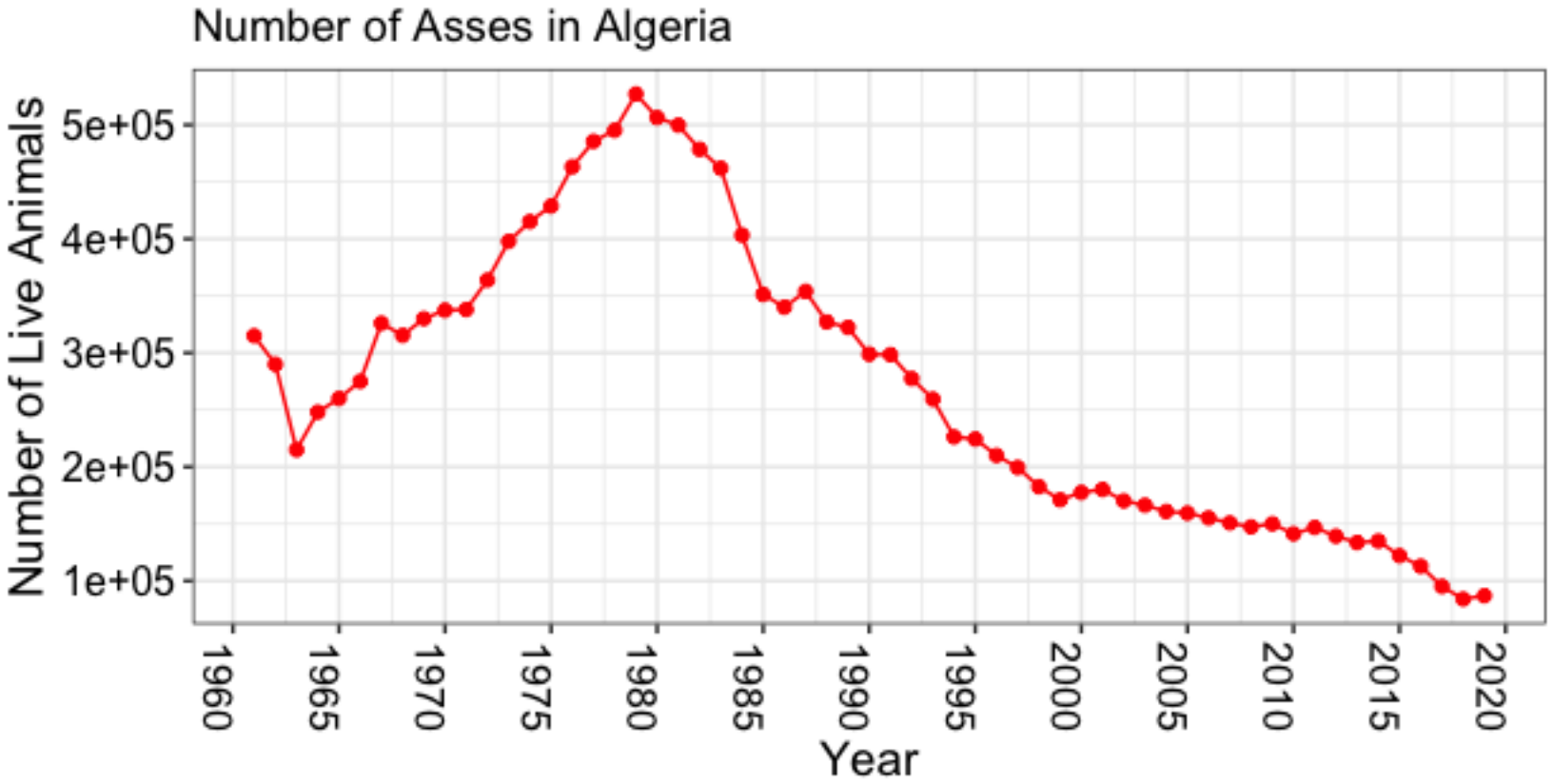
For more information about GBADs data licensing: http://www.gbadske.org/Documentation/DataGovernanceHandbook/dataOwnership.html

3.3. Data citations

- **Just like written communications, data needs to be cited too!**



Where is this data from!?



Data Source: Food and Agriculture Organization of the United Nations. (2021). FAOSTAT, Crop and Livestock Products, Live Animals. [Data file]. Retrieved August 30, 2021 from http://www.fao.org/faostat/en/#data/QCL

3.4. Code: GBADs GitHub

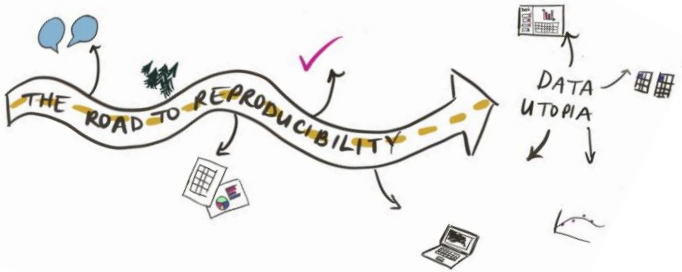
- A place for **sharing code** for models such as biomass calculations
- Allows us to convert code into tools, streamline calculations and contribute to Open Science and reproducibility
- Best practices for R code in Data Governance Handbook

GitHub

R Studio

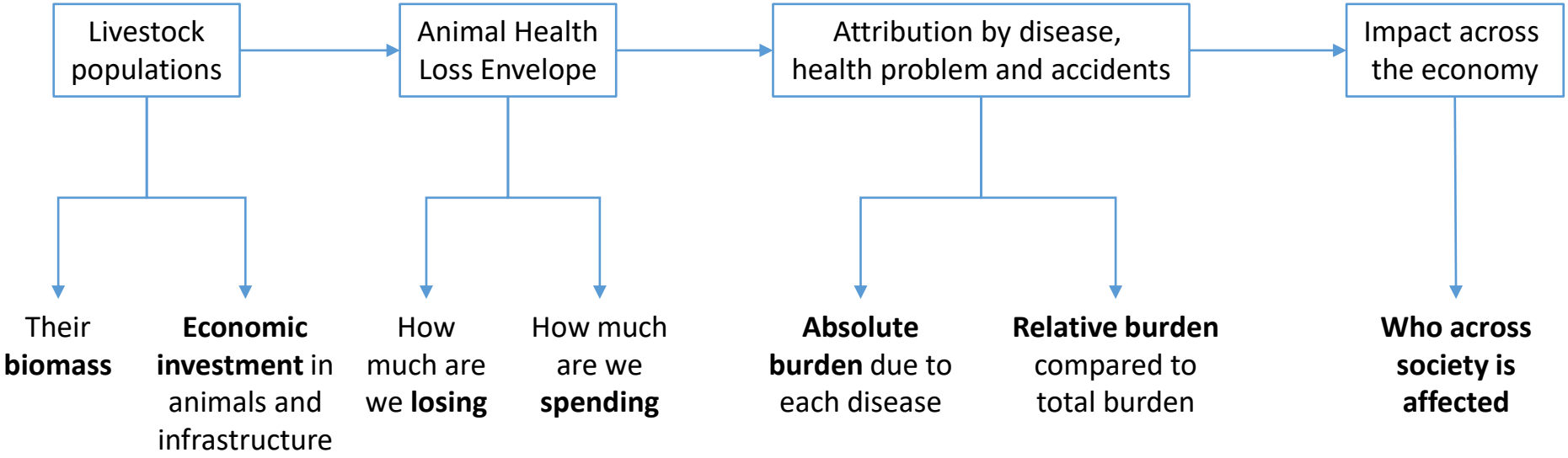
GBADsInformatics

Informatics – Road to Reproducibility



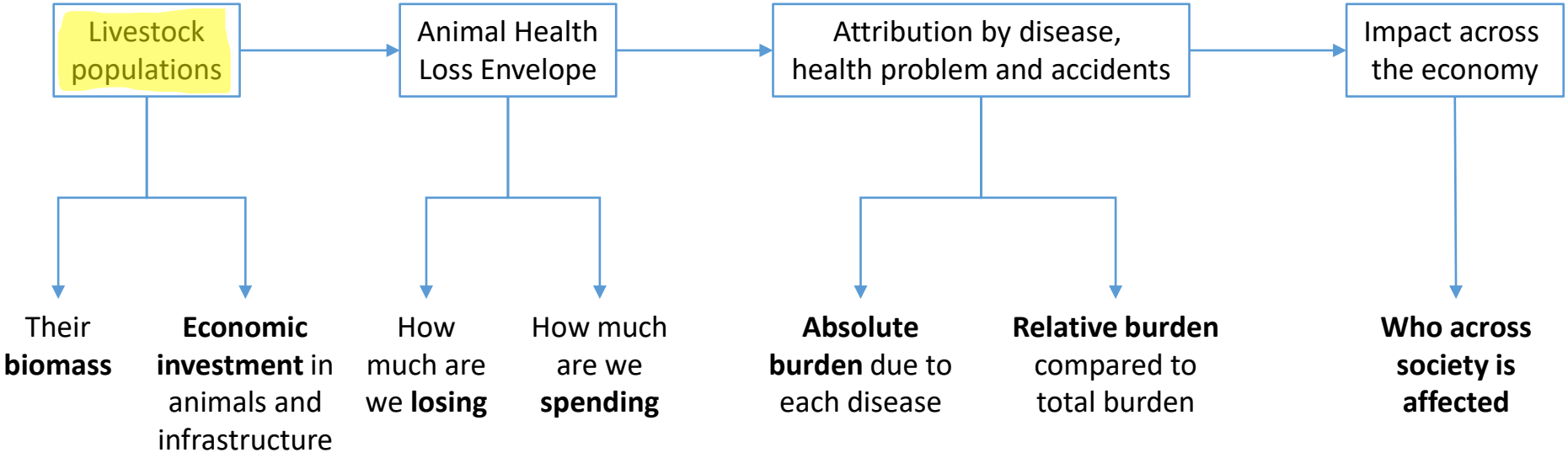
1. Values and goals
2. Data and metadata quality
3. Data ingestion and acquisition
4. **People and processes**
   - **4.1. Working with other themes**
   - **4.2. What the Informatics Theme can offer to others**

GBADs - Analytical structure

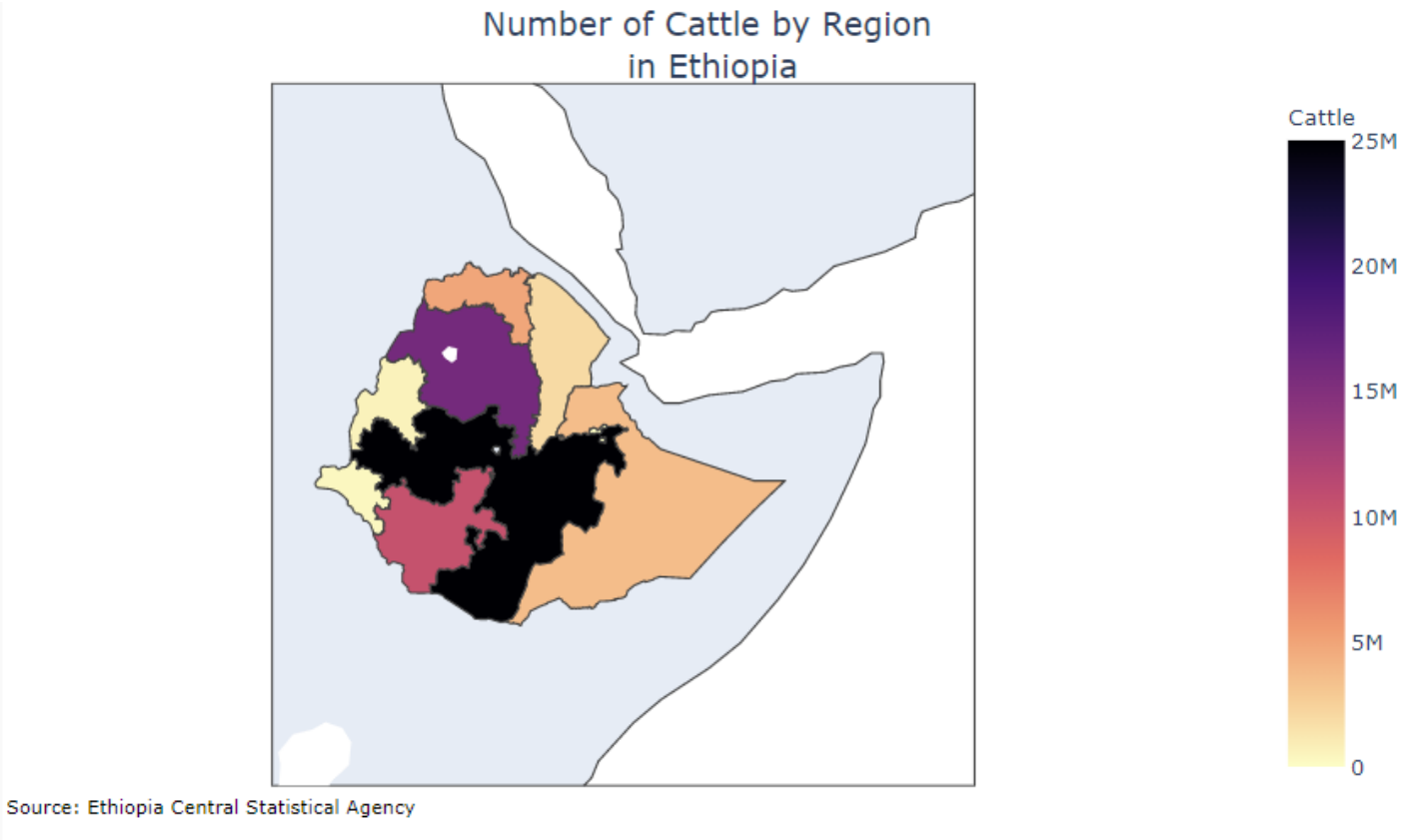


Rushton et al 2021

GBADs - Analytical structure

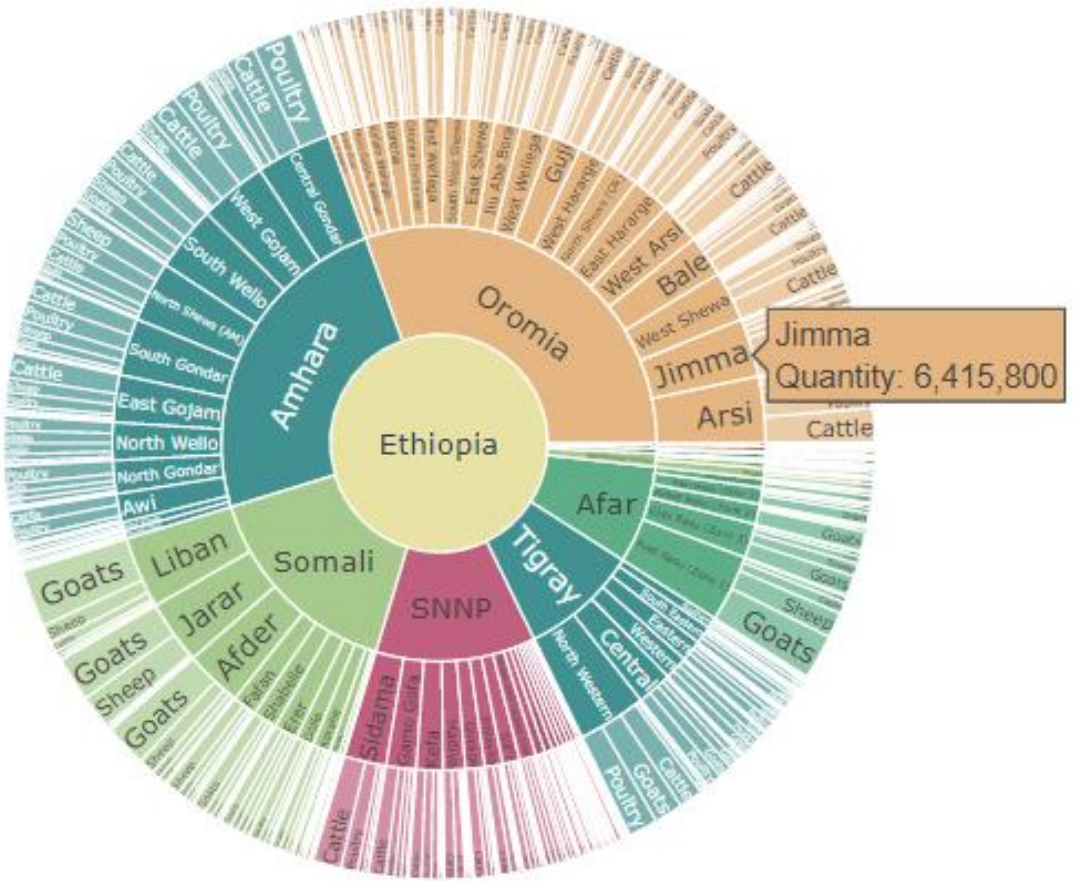


Rushton et al 2021



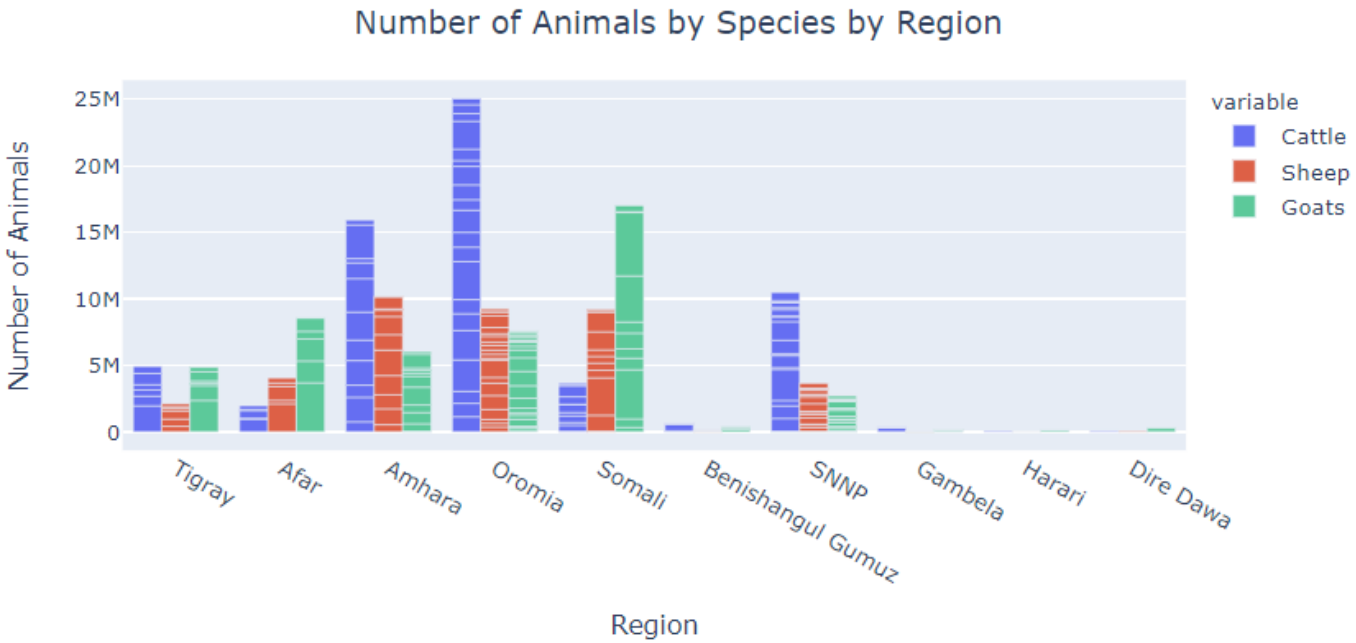
Source: Ethiopia Central Statistical Agency

Population by Species across Ethiopia

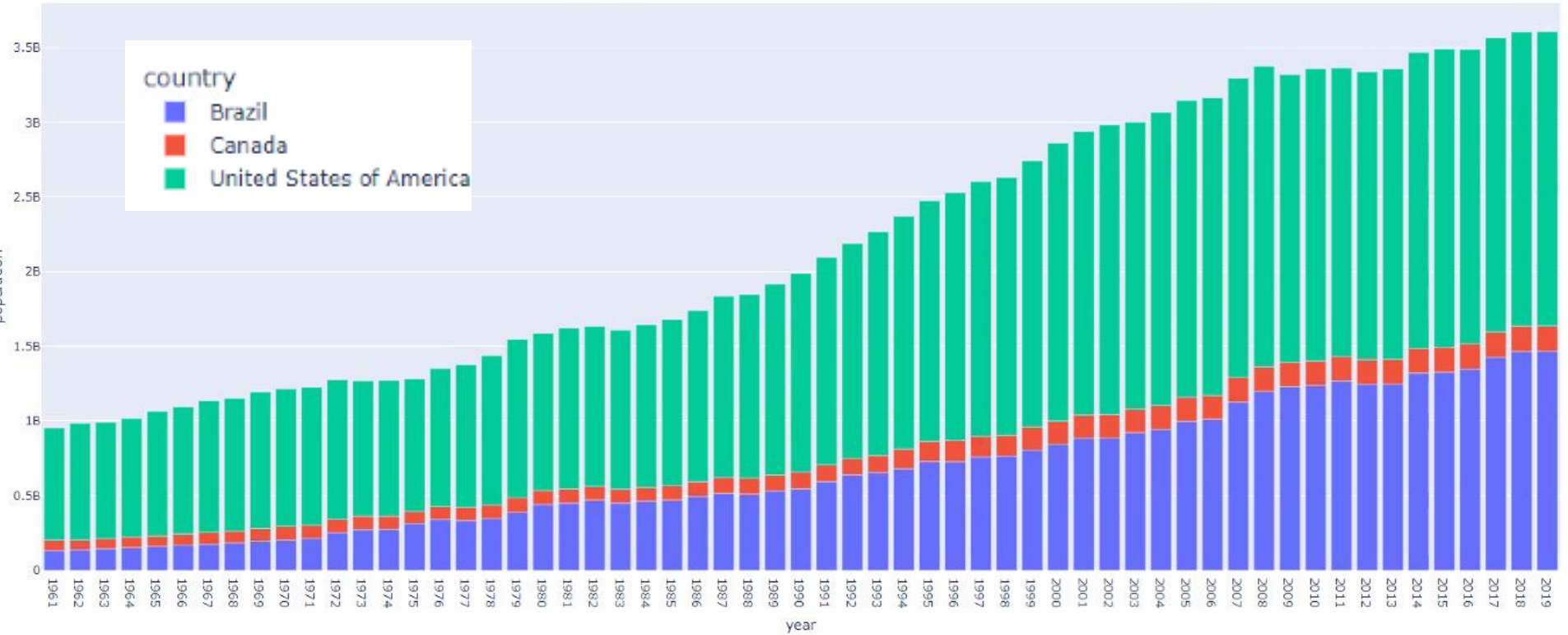


https://animalhealthm

GBADs



Source: Ethiopia Central Statistical Agency



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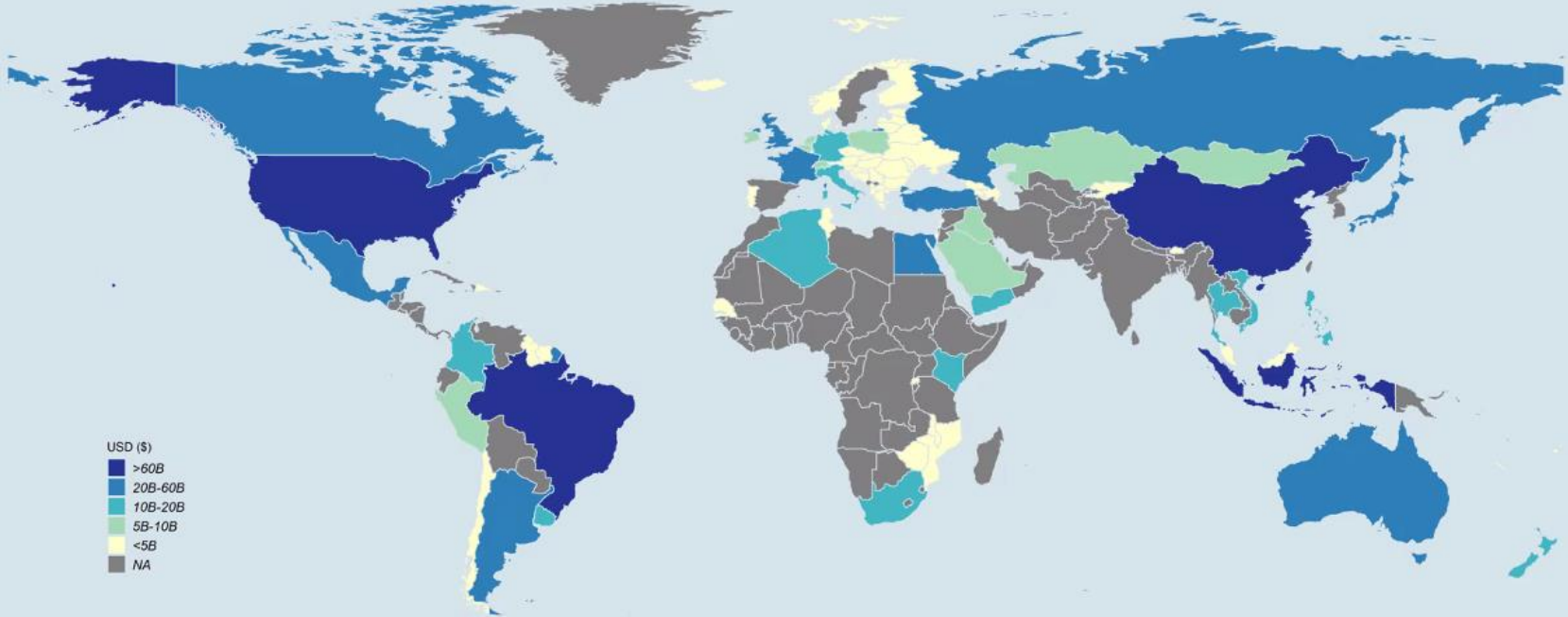
GBADs

Scenario AS2

What is the global distribution of the value of animal stock in 2015?

This estimate includes cattle, chickens, pigs, sheep, pigs, camels, mules, and horses.
All values are reported in current US dollars.

Preliminary results



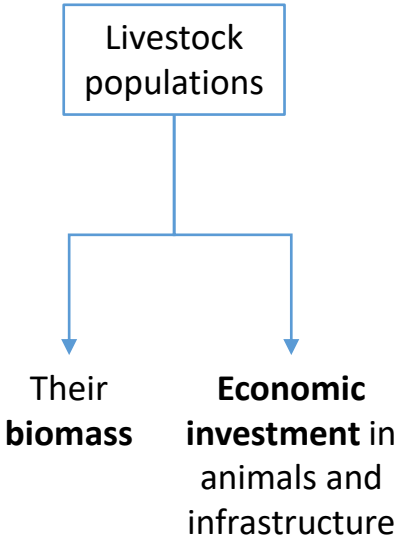
Data: FAO (2021) Notes: AS2 does not include live aquatic animals due to unavailable data. For NA quantity and/or price/value data is missing.

GBADs - Analytical structure

Livestock populations

Rushton et al 2021

GBADs - Analytical structure



Rushton et al 2021

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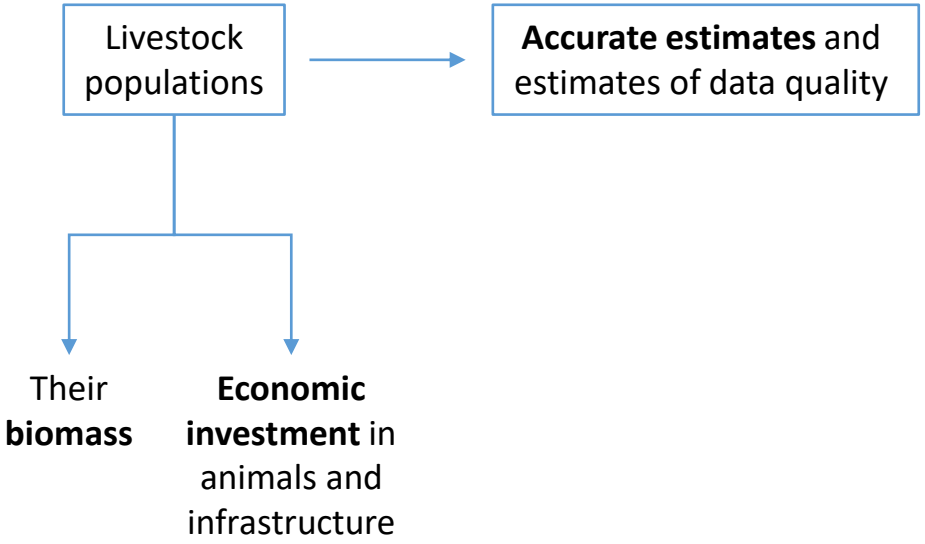
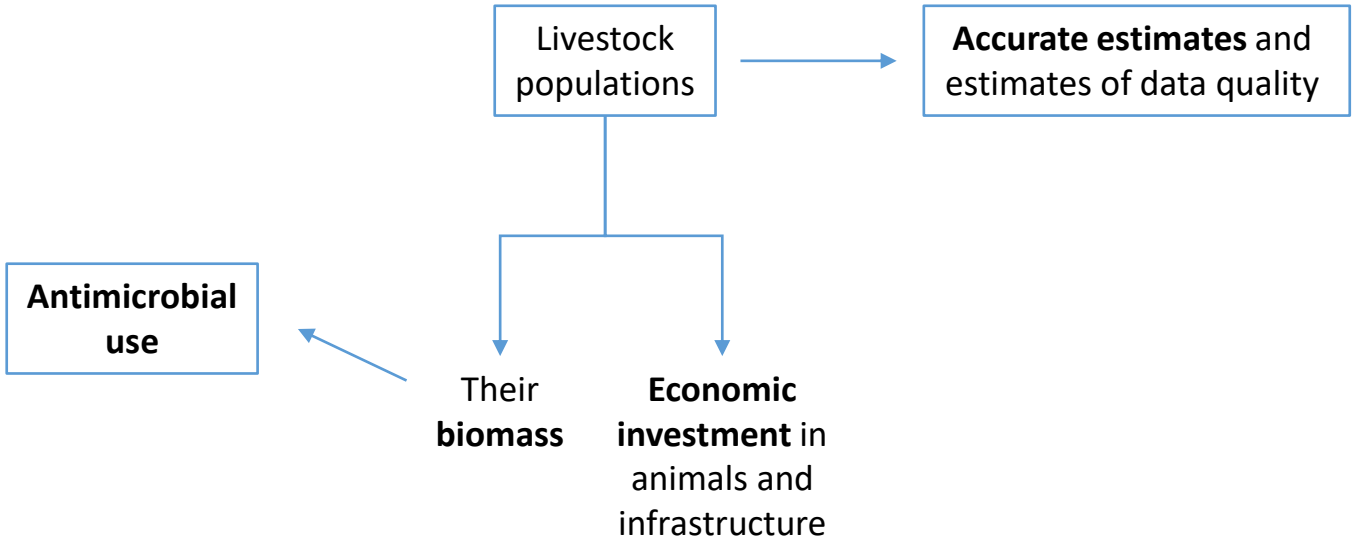


Rushton et al 2021

GBADs - Analytical structure



Rushton et al 2021

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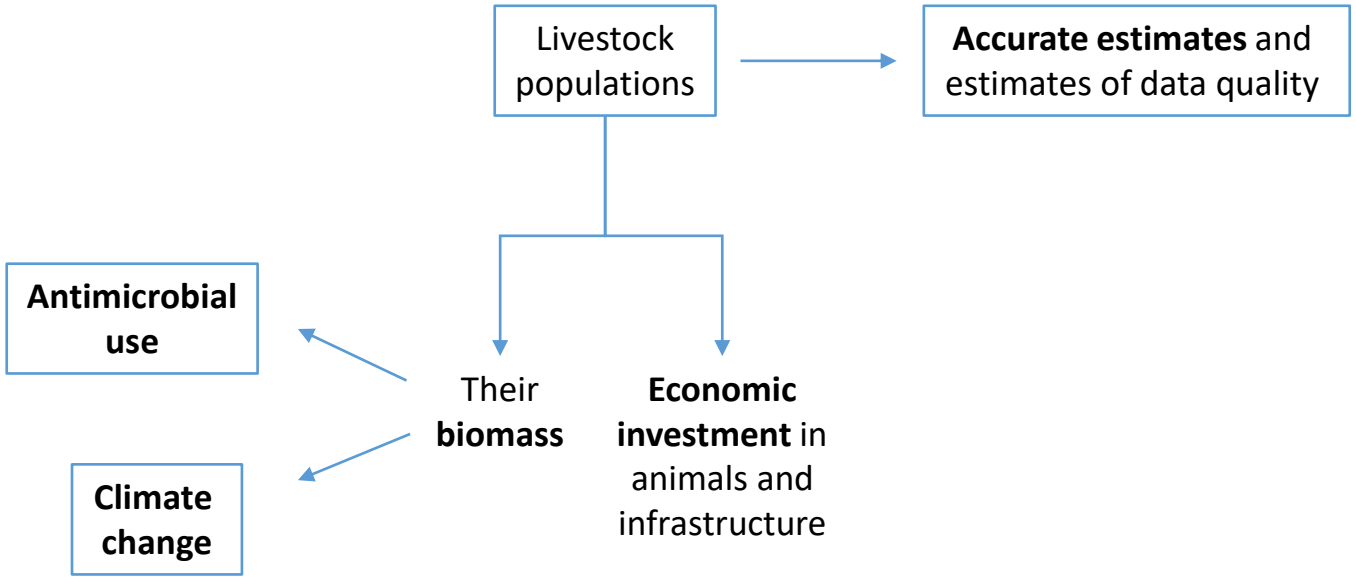
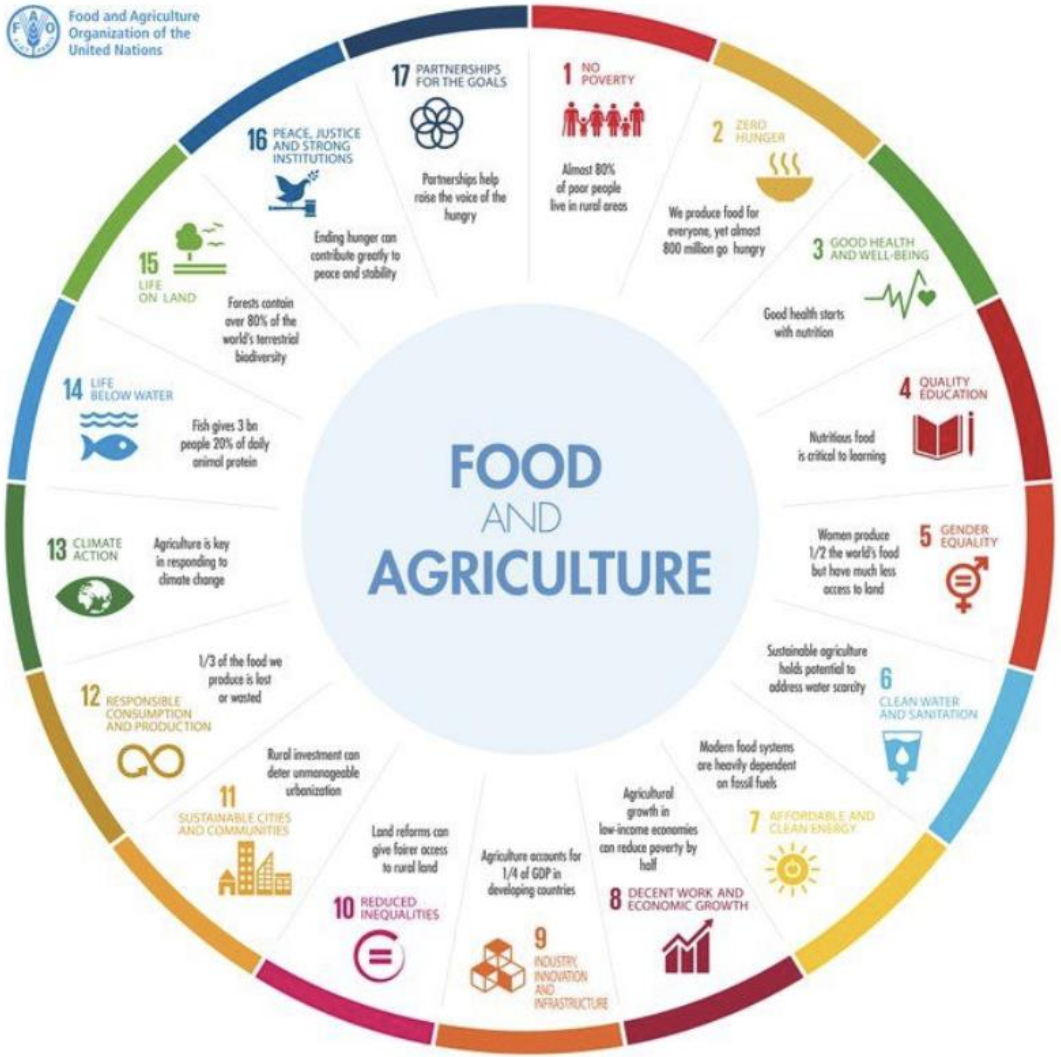


Rushton et al 2021


Food and Agriculture Organization of the United Nations
FOOD AND AGRICULTURE
1 NO POVERTY
Almost 80% of poor people live in rural areas
2 ZERO HUNGER
We produce food for everyone, yet almost 800 million go hungry
3 GOOD HEALTH AND WELL-BEING
Good health starts with nutrition
4 QUALITY EDUCATION
Nutritious food is critical to learning
5 GENDER EQUALITY
Women produce 1/2 the world's food but have much less access to land
6 CLEAN WATER AND SANITATION
Sustainable agriculture holds potential to address water scarcity
7 AFFORDABLE AND CLEAN ENERGY
Modern food systems are heavily dependent on fossil fuels
8 DECENT WORK AND ECONOMIC GROWTH
Agricultural growth in low-income economies can reduce poverty by half
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
Agriculture accounts for 1/4 of GDP in developing countries
10 REDUCED INEQUALITIES
Land reforms can give fairer access to rural land
11 SUSTAINABLE CITIES AND COMMUNITIES
Rural investment can deter unmanageable urbanization
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
1/3 of the food we produce is lost or wasted
13 CLIMATE ACTION
Agriculture is key in responding to climate change
14 LIFE BELOW WATER
Fish gives 3 bn people 20% of daily animal protein
15 LIFE ON LAND
Forests contain over 80% of the world's terrestrial biodiversity
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
Ending hunger can contribute greatly to peace and stability
17 PARTNERSHIPS FOR THE GOALS
Partnerships help raise the voice of the hungry

GBD 20

https://animalhealthmetrics.org

GBADs

GBD 20

Global Burden of Crop Loss

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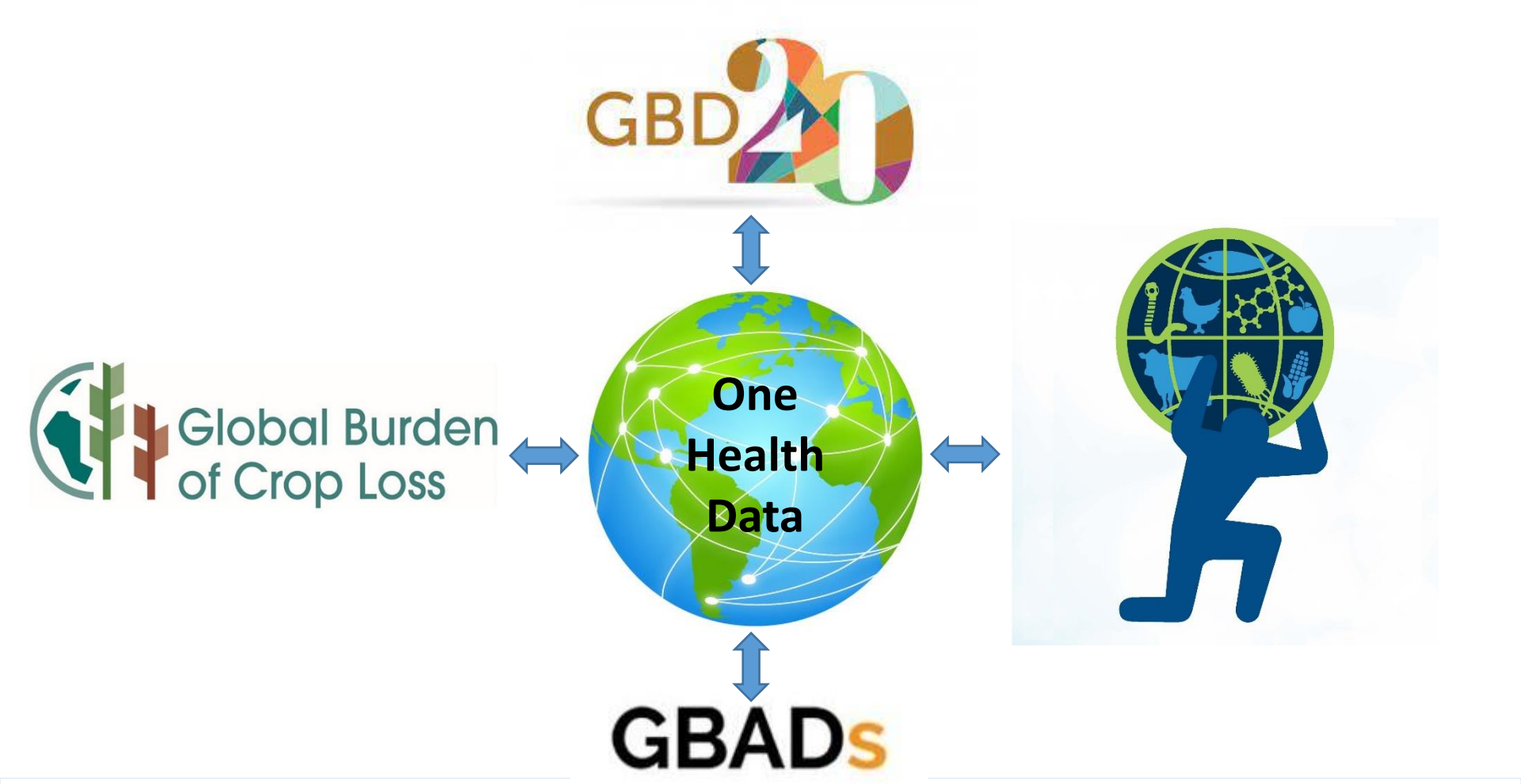

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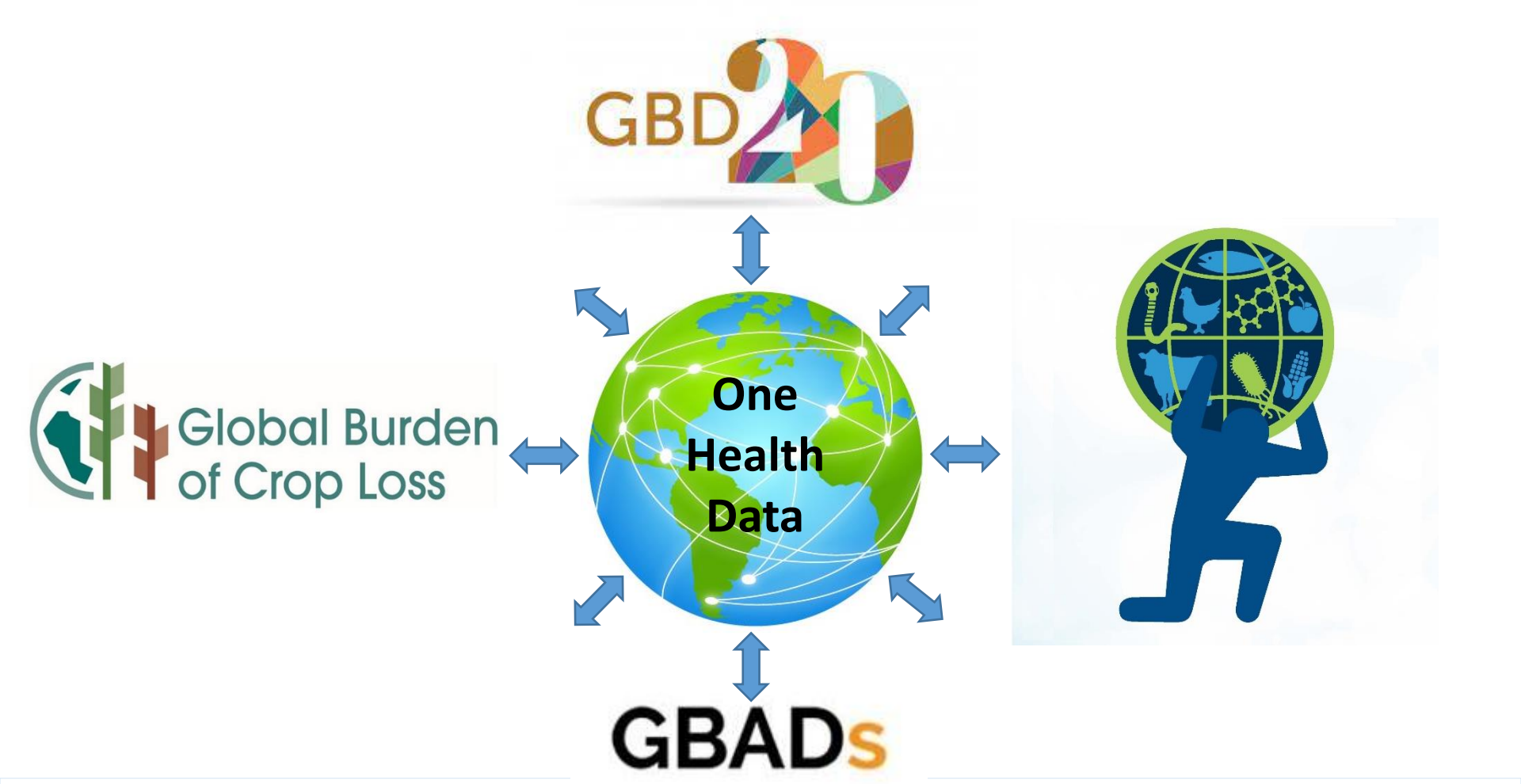

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