The Teaching of Epidemiology

Implications of the multifarious application of epidemiology

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Evolution of Epidemiology

- **Hippocrates (400 BC)**
  - Occurrence of disease and environmental and host factors such as behaviors, not only supernatural
  - Epidemic (dzz that are "visited upon" a population) and endemic (dzz that reside within" a population).
- **John Graunt (1662)**
  - Mortality data publication - patterns of birth, death, and disease occurrence, and differences by sex, residential area and season
- **William Farr (1800)**
  - Surveillance and vital statistics (Britain)
- **John Snow (1854)**
  - Field epidemiology – London cholera outbreak and it control
- **Mid- and late-1800s**
  - Epidemiology of disease occurrence - infectious diseases.
- **1930-1940s (2nd WW)**
  - Inclusion of EPI of noninfectious diseases and explosion of EPI research methods
- **1980s**: Injuries and violence.
- **1990s**: Molecules and genes.

Outcomes
Disease, mortality
(hard endpoints)

Population
Humans

Epidemiologists
Biomedical
Statisticians

Outcomes
Much more than disease and mortality
(including soft endpoints like biomarkers)

Population
Humans, Animals, Plants

Epidemiologists
Biomedical, Engineers, Humanities, Legal, Law enforcement, Environmentalists, Journalists Informaticians Comp. Scientists Biosecurity Managers/Admins etc

EPIDEMIOLOGY

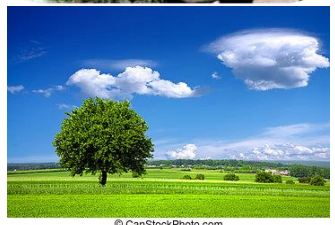
core CONCEPTS & PRINCIPLES

Humans

Plants

Animals

Water and aquiculture



Environment

Biodiversity

Applied

- Basic research
- Applied research
- Clinical research
- Intervention research

- Eradication
- Evaluation
- Monitoring
- Programming
- Surveillance

- PH policy
- PH practice

- Major disciplines
- Sub-disciplines
- Sub-sub-disciplines
- E.t.c

- **Comprehension of concepts and principles**
  - Likely to be better when definitions are clear, foundation courses are well illustrated, and illustrations and examples are based on relevant contexts

- **Current challenge**
  - Multiplicity of students/trainees regarding previous training, disciplines/areas of specialization, future career interests (academia, research, leadership/management, public health, legal, mass media etc)
  - Ensuring that students; 1) understand and appreciate the core EPI concepts/principles; 2) appreciate their application to epidemiological reasoning; 3) are open to applying them appropriately in scenarios/situations pertinent to their areas of focus

- **School of Public Health, Makerere University**

Master's Programs

- Public Health
- Health Services Research
- Disaster Management
- Public Health Nutrition
- Health Informatics
- Biostatistics
- Monitoring and Evaluation
- Occupation and Environmental Health

Background

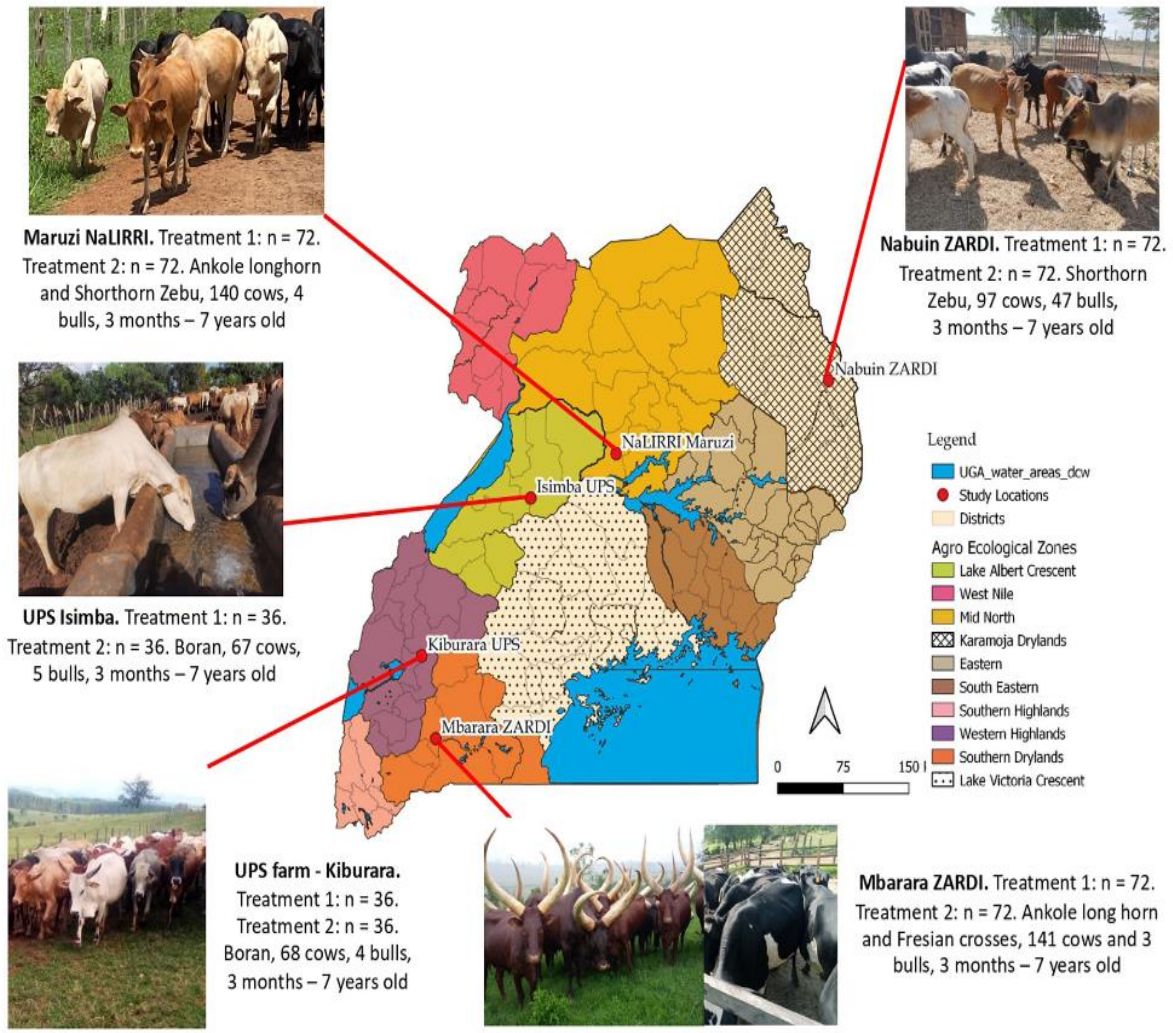
Biomedical
Humanities
Engineering
Law and law enforcement
Computer Science
Informatics
Statistics
Agriculture, veterinary
Environmental Health
Military and Security
Journalism, mass media
Politics, Policy etc

Country of origin

Uganda
Kenya
Tanzania
South Sudan
Sudan
DRC
Somalia
Eriteria
Zambia
Botswana
Eswatini
Nigeria
Liberia
Malta

Application of RCT methods and principles in veterinary medicine - Uganda

- Evaluation of effectiveness and safety of Subolesin anti-tick vaccine in Ugandan multi-site field trial
- Randomized, double blind placebo controlled confined field trial in 5 field sites. [age, BMI, sex, species]
- Assessed the safety, efficacy and effectiveness of a Subolesin vaccine against ticks (*R. decoloratus, R. evertsi, R. appendiculatus and Amblyomma variegatum)*
- **Results**
  - Vac safe, protected against anemia and infection
  - Reduced the number of infested cattle, tick fitness
  - Effectiveness against multiple tick species between 93.2% at 167-196 days post-vaccination (dpv) and 61.4% at 251–327 dpv.
  - Total integrated vaccine efficacy/effectiveness was estimated as 98.8%



Kabi, Fredrick, et al. "Evaluation of effectiveness and safety of Subolesin anti-tick vaccine in Ugandan multi-site field trial." npj Vaccines 9.1 (2024): 174.

In Science change is the only constant factor

Epidemiology, like other scientific disciplines, is undergoing changes in its underlying philosophy and approach

Pearce N., Douwes J., Research at the interface between human and veterinary health, Preventive Veterinary Medicine, 2013; https://doi.org/10.1016/j.prevetmed.2013.05.010

How we define and teach epidemiology needs to adapt to the changing philosophy of the discipline

Issue 1: Can one definition of Epidemiology based on a discipline, population and specific outcome(s) and goal suffice in this rapidly changing world?

- ❑ The study of the distribution and determinants of disease frequency in human populations and the application of this study to control health problems.

- ❑ Use of EPI knowledge & application of its principles go beyond human populations and disease outcomes and their frequency, and control of health problems

Issue 2:

Illustrations and examples in textbooks do not cover every student's local context, previous training, current/future area(s) of specialization.

- **As many definitions of epidemiology as the disciplines, specialties and sub-disciplines/specialties that use epidemiological principles and concepts to adduce evidence**

- **Frérot M et al.** ***What is epidemiology? Changing definitions of epidemiology 1978-2017.*** *PLoS One. 2018 Dec 10;13(12):e0208442. doi: 10.1371/journal.pone.0208442.*

  - 102 definitions of epidemiology
    - 93 for human medicine, including subspecialties of epidemiology (n = 24)
    - 9 for veterinary medicine.

We should consider;

1. the evolving philosophy of epidemiology and its widening use,
2. the implications of above on the teaching of epidemiology and application of its principles,
3. remove the discipline/specialty, population components from the definition of EPI
4. Create a definition that is based on the intent of the core principles and concepts and the goal of epidemiology; one that can used for various disciplines/specialties, populations and outcomes in which the principles can be applied

Epidemiology

Is the study of scientific concepts and principles that aid the understanding of relationships between exposures and outcomes and the application of those concepts and principles in human, animal and plant populations, to the quantify, describe and analyze events/outcomes, determine the likelihood of association/causation, and make correct/valid inferences/conclusions


THANK YOU
FOR YOUR
ATTENTION