



Food and Agriculture
Organization of the
United Nations



World Organisation
for Animal Health

8TH ANNUAL MEETING OF THE PPR GLOBAL RESEARCH AND EXPERTISE NETWORK (PPR-GREN)

25 – 27 NOVEMBER 2025 QINGDAO, CHINA



中华人民共和国农业农村部

Ministry of Agriculture and Rural Affairs of the People's Republic of China



中国动物卫生与流行病学中心
China Animal Health and Epidemiology Center

A GF-TADS initiative for
PPR control



GF-TADS
GLOBAL FRAMEWORK FOR THE
PROGRESSIVE CONTROL OF
TRANSBOUNDARY ANIMAL DISEASES





Post-vaccination evaluation and population immunity studies

Marion Bordier, marion.bordier@cirad.fr

France 

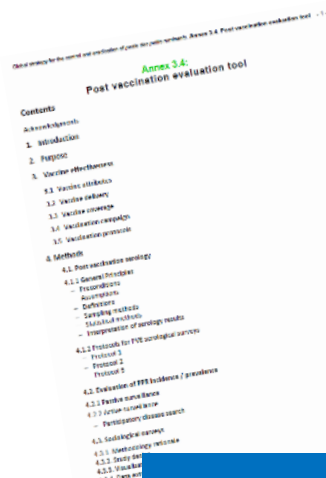




VACCINATION

=

Key measure to
control and eradicate
PPR



SEROLOGICAL
SURVEY =

Key tool to evaluate
the vaccination efforts



Measurement of the **population immunity** (the proportion of animals carrying antibodies)

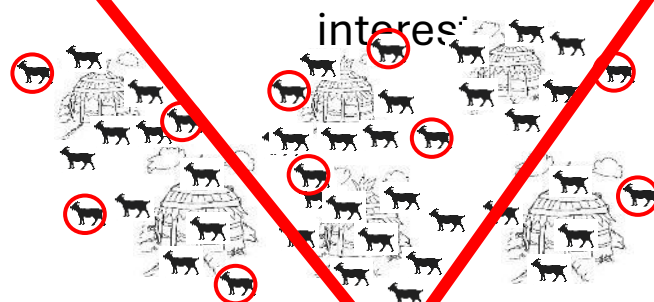
- A good proxy of the vaccination efficacy (seroconversion of vaccinated animals)
- A good indicator to monitor the level of protection of the small ruminants population against PPRv (over 70%)

Valuable information to orient future strategies to manage the disease

How to estimate the immunity level of the population?

Observe a sample of animals in the population of interest

① **Simple random sampling** of animals in the population of interest



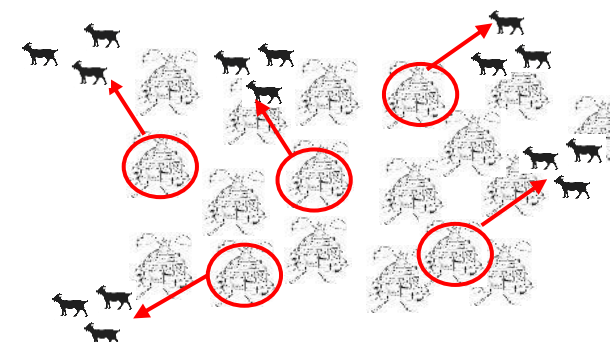
Count of positive animals

Animal seroprevalence =

$$\frac{\text{nb positive animals}}{\text{nb of sampled animals}}$$

Not possible for logistic constraints

② **Multi-stage sampling:** random sampling of epidemiological units in which animals are randomly sampled



Count of protected epi units
(animal seroprevalence > 70%)

Prevalence of protected epi units =

$$\frac{\text{nb of protected units}}{\text{nb of sampled units}}$$

Need a bit more complex method for data analysis

Sampling method

- Choice of the most relevant epi units regarding the context
- Calculation of the number of epi units to be sampled to get an estimation of the number of protected epi units at the scale of the study area
- Random sampling of the epi units across the study area (inference)
- Calculation of the number of animals to be sampled to assess if the epi unit is protected (animal seroprevalence > 70%)
- Random selection of the animals in the epi unit



For an infinite population of epi units, perfect test, an expected prevalence of 50% and a desired precision of 10%

-> 97 epi units



Calculated to reject the hypothesis that the animal seroprevalence is below or equal to 70% if the animal population is over 100, with a desired precision of 5%

-> at least 9 animals

Data collection

- One blood sample (sera) to be screened with ELISA test
- Associated field data of interest
 - Location (using official toponyms)
 - Species
 - Age
 - Sex
 - Vaccination status

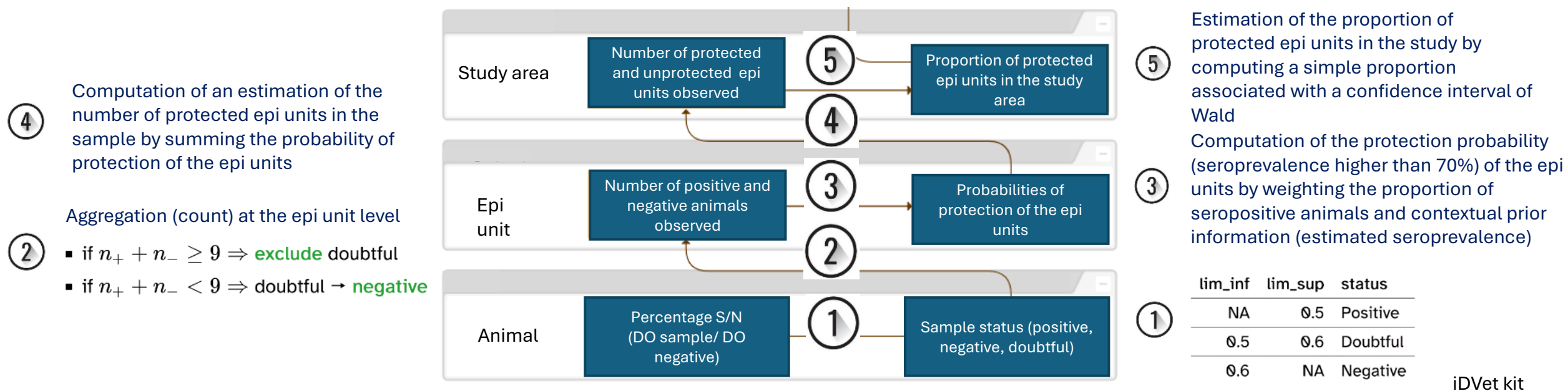


©Lidisk

i

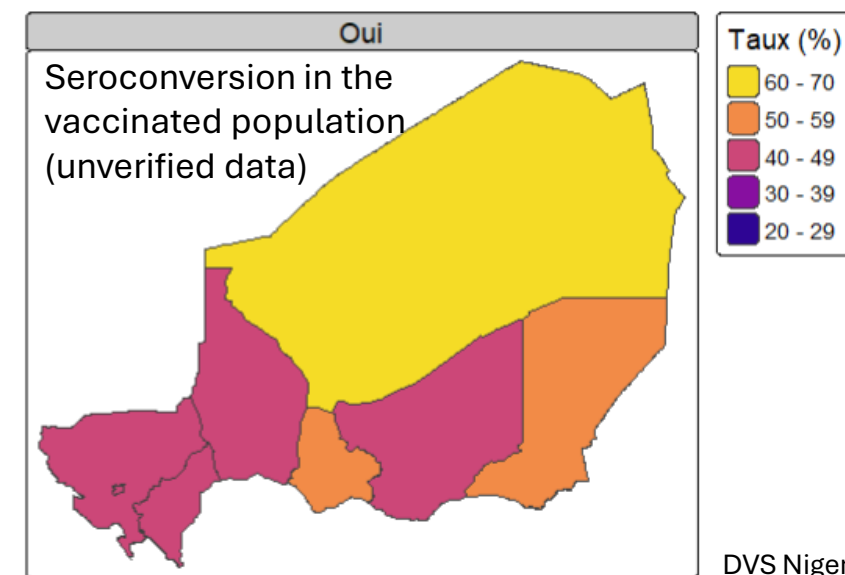
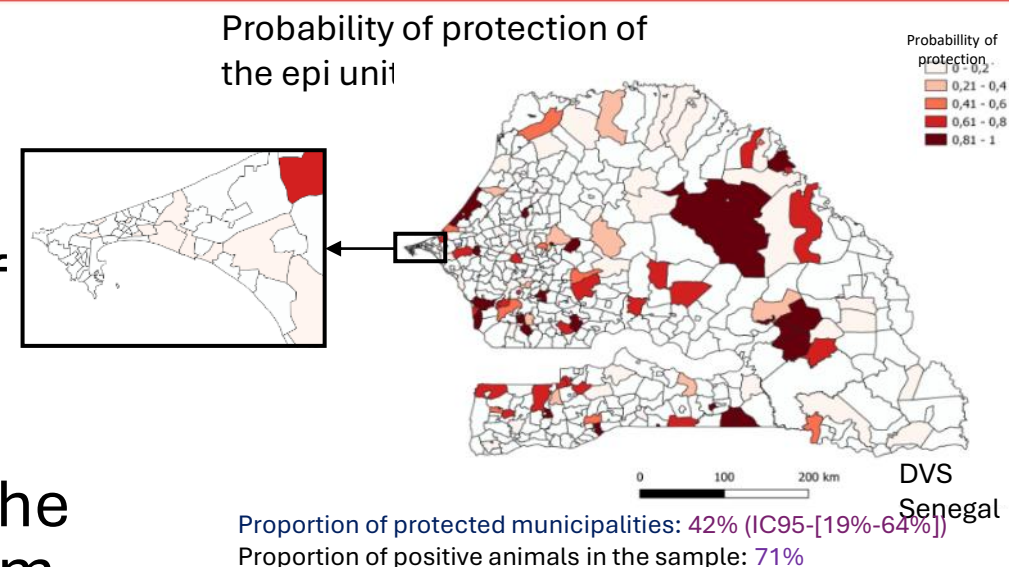
Data analysis

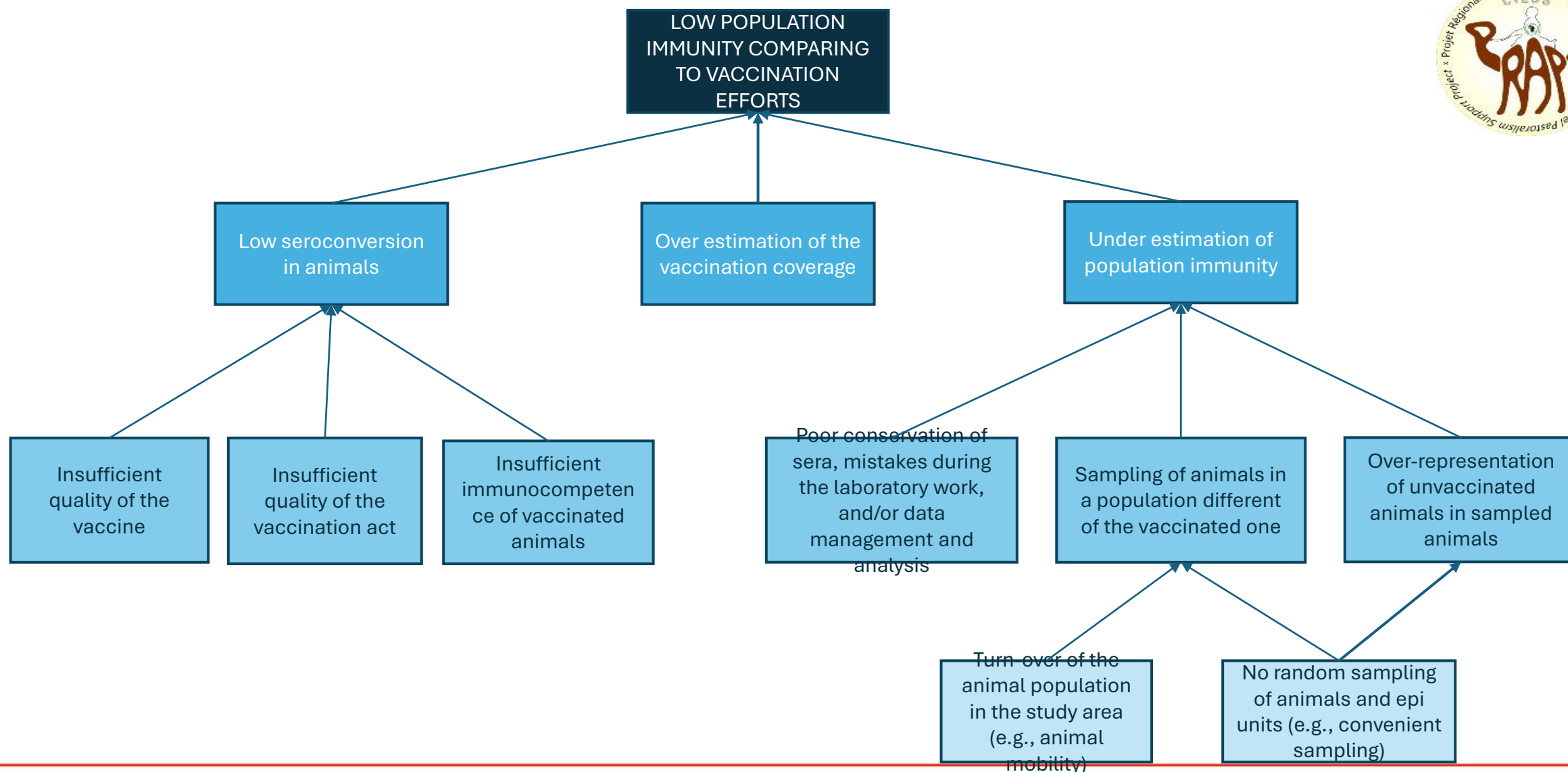
- Description of what has been done compared to what has been planned (number of epi units and animals sampled, random sampling strategy, field data collection)
- Estimating the proportion of protected epi units using a Bayesian approach

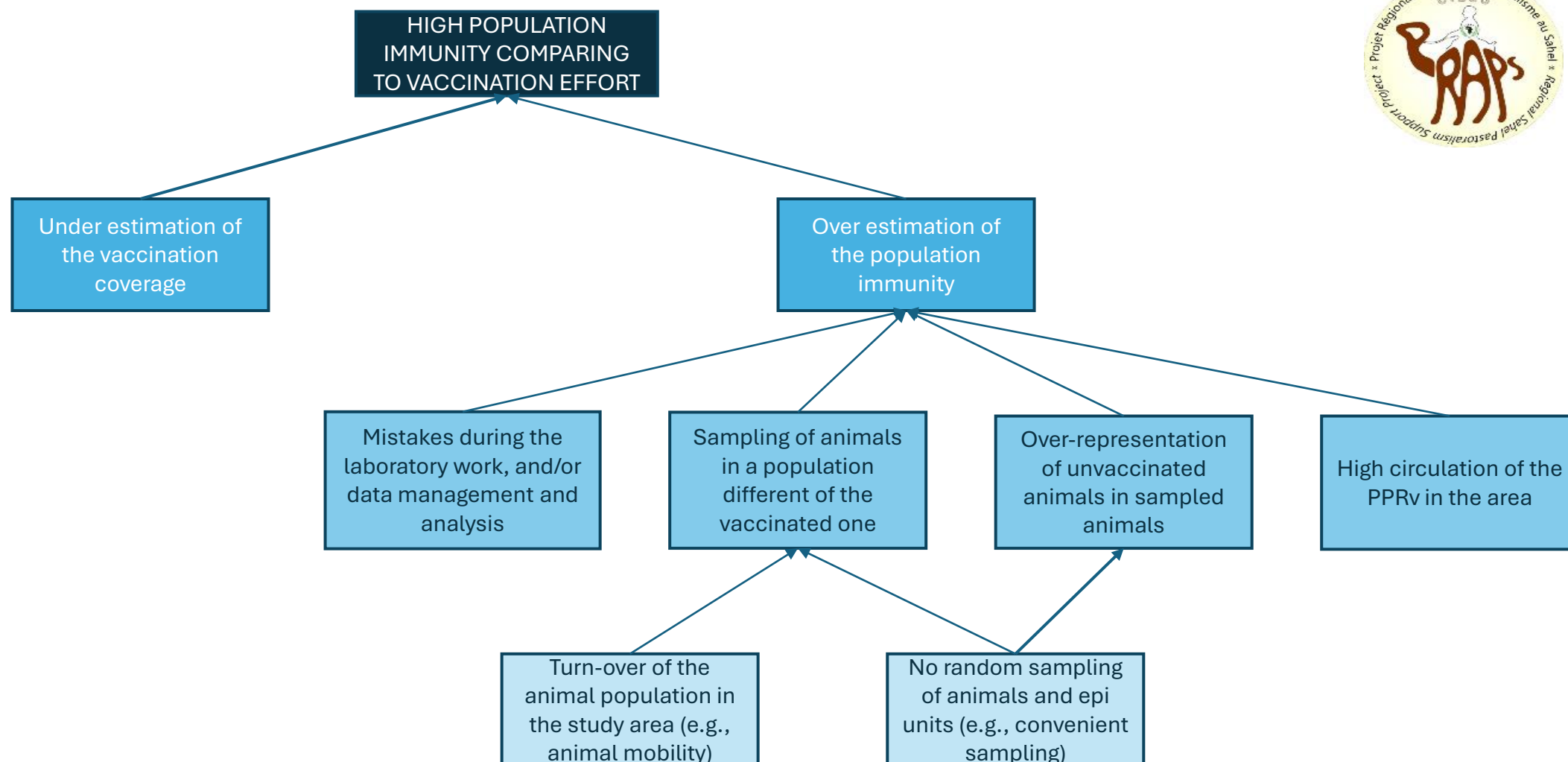


Result interpretation

- Assess population immunity (proportion of protected epi units) in relation to the 70% cut-off and the evolution over the years
- Comparison of the sample structure with the population structure to assess if the random sampling has been respected
- Calculation of the seroconversion rate in the vaccinated animal sample to assess the vaccination efficacy (95% seroconversion rate)
- Assessment of the consistency between the population immunity obtained and the vaccination coverage







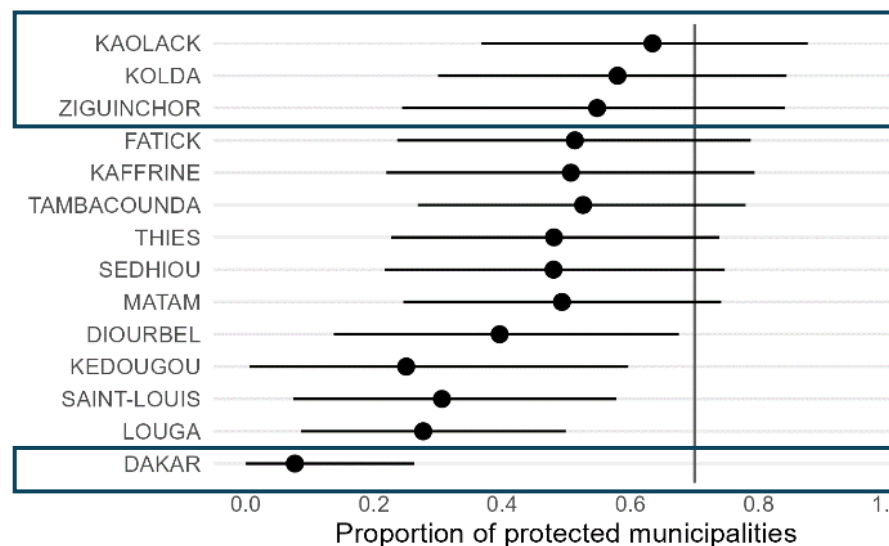
Senegal

Multi-stage sampling, with municipalities as the primary epi unit and the village as the secondary epi unit

Proportion of protected municipalities: 42% (IC95-[19%-64%])

!!! Extremely different from the proportion of positive animals in the sample (71%)
!!!!

Seroprevalence in the population tagged: 81%



Overrepresentation of vaccinated animals in the sample (targeted sampling by field agents)

Low seroconversion (decreased titre of the vaccine)

Results exploitation

- Monitoring of the population immunity towards the serological target of 70%
- Assessment of the implementation quality of the serological survey protocols
 - identification of deviations and corresponding corrective actions to improve the ongoing survey and future surveys (protocol's contents and implementation)
 - identification of deviations that might bias the serological results
- Orientation of future interventions for vaccination, surveillance, team supervision/training, and audit of the vaccination socio-technical framework



Thank you



Organisation mondiale
de la santé animale



WORLD BANK GROUP
Environment & Natural Resources

