



CASE STUDY : APPLICATION OF CASE CONTROL IN PRACTICE LESSONS FOR THE DISCUSSION

Ashish Sutar

Epidemiological study design training 2021

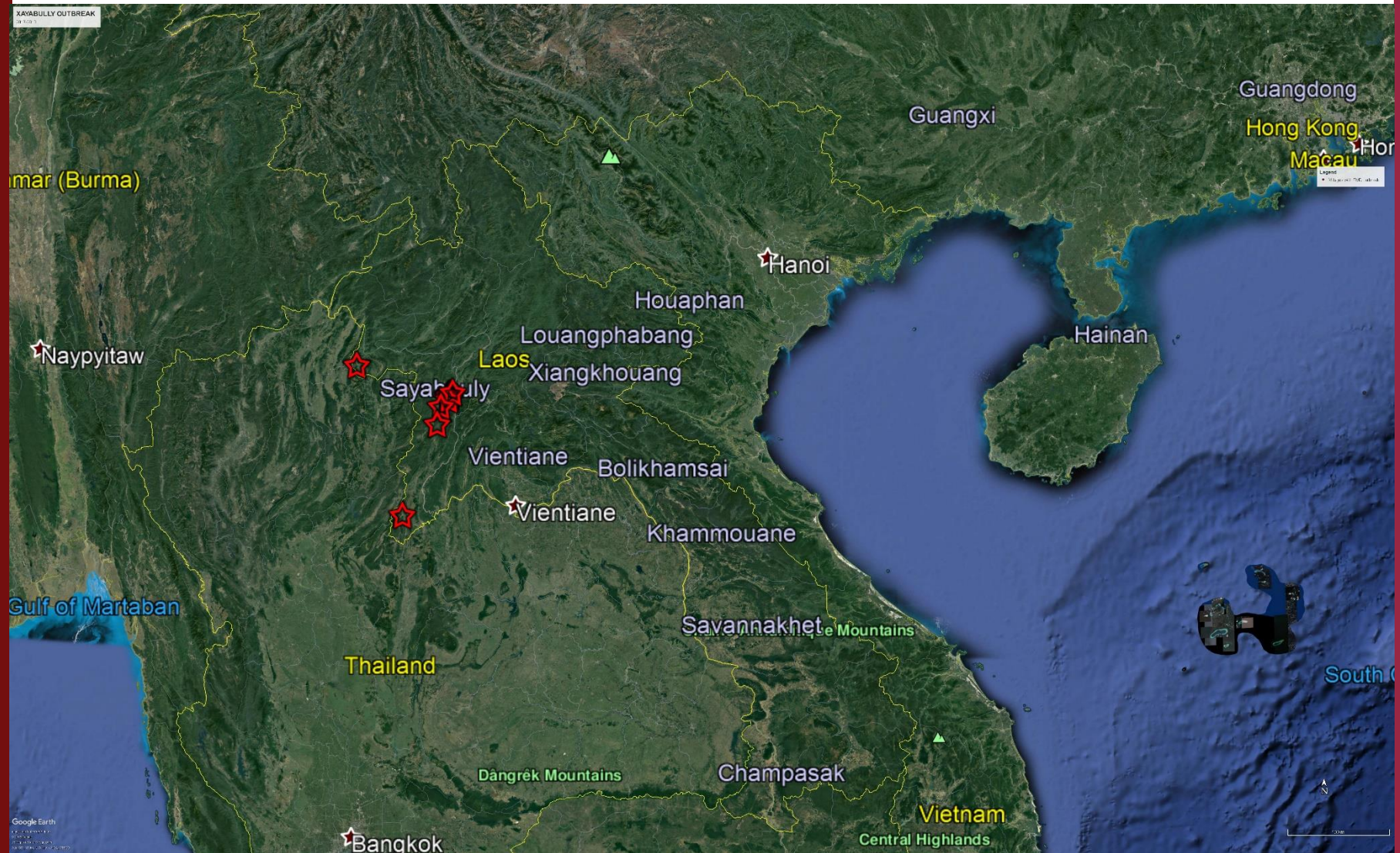
25 November 2021

PRESENTATION OUTLINE

- **Background of the case control study
(retrospective FMD outbreak investigation)**
- **Approach adapted by field team to apply
case control study in practice during
outbreak investigation.**
- **Discussions**

RETROSPECTIVE INVESTIGATION

XAYABULY LOCATION



BACKGROUND

- FMD Endemic setting
- FMDV serotype O is the most prevalent.
- FMD spreads rapidly in the region.
- Limited understanding of FMD epidemiology
- Very few quantitative data available.
- **The estimated mean financial losses due to FMD were USD 436 per event in an affected HH.**
- FMD has severe financial impact on poorer households.

FMD IN XAYABULLY

- Retrospective outbreak Investigation in Xayabully , Lao PDR **(August 2018).**
- 44 FMD outbreaks officially reported in 4 districts affecting 5239 cattle and buffaloes out of 12,041 large ruminants in Houaphanh and Xayabully province of Lao PDR three districts namely **Xayabully, Khop, and Boten starting from 20 November 2017 to 25th May 2018.** (DLF's FMD outbreak data)
- Team Department of Livestock Fisheries (DLF) led by Dr Vilideth Suriya and PAFO Xayabully

Source : Department of Livestock and Fisheries (DLF) and NZ funded OIE DLF Lao PDR FMD control Project

INVESTIGATION SETTING



OBJECTIVES OF THE INVESTIGATION

- By revisiting the site to review the epidemiological situation of FMD reported by DLF during November 2017 to May 2018 in Xayabuly province.
- To conduct a retrospective investigation of risk factors for FMD introduction and spread.



APPROACH

1. BACKGROUND OF OUTBREAKS
2. FIELD PREPARATIONS
3. MEETING WITH STAKEHOLDERS (BREIF)
4. TOOLS
 - 4.1 Case definition
 - 4.2 Methodology
 - 4.3 Questionnaire
 - 4.4 Diagnostics
5. LIVESTOCK POPULATION SEEN WITH FMD
6. RISK FACTORS
7. HH RESPONSE
8. CONTROL STRATEGIES
9. MEETING WITH POLICY MAKERS AND KEY ACTORS
10. DISCUSSION



CASE CONTROL APPROACH

Method and steps taken to implement case control study

Determine a case definition

The household level case definition was determined based on preliminary information on the location (Epiunits) affected animal population time and disease.

List suspected risk factors

Risk factors associated with the disease and tested with the two groups

Design a questionnaire

- In corporate HH, animal details, case definition, risk –protective factors
- Test the questionnaire

Select case and control : apply the questionnaire

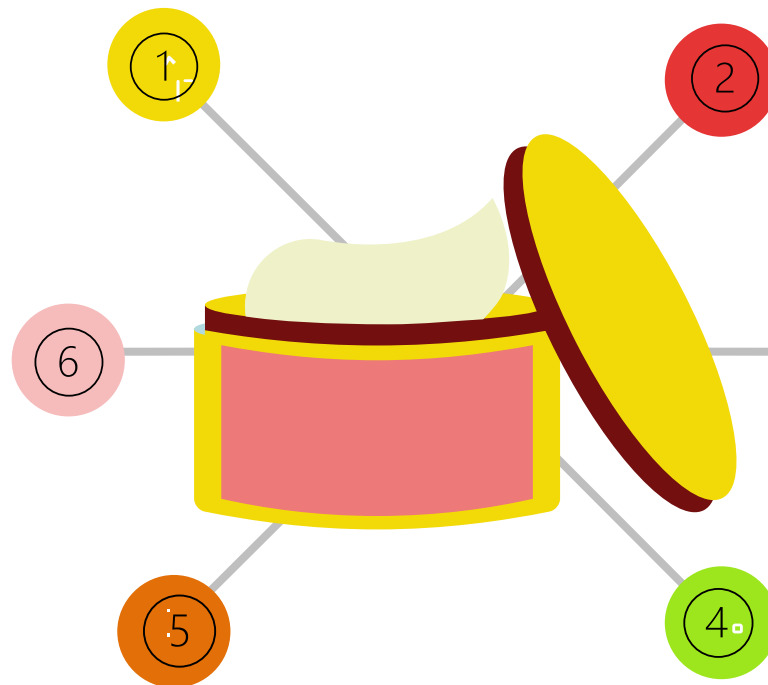
- Ensure the case definition is well understood by the investigation team.
- Selection of households
- Data recording template

Analyse data and interpret findings

- Excel sheet
- Odds Ratio table
- Evaluate Risk

Write a report

- Report Investigation findings to inform decision making.
- Communicate findings to local authorities including villages to obtain the support for control measures and future surveys and investigation.



DETERMINE CASE DEFINITION

- The household (HH) level case definition was determined as **“One or more animals seen with foot or mouth lesions with or without strong salivation in an HH during January 2017 to August 2018”**

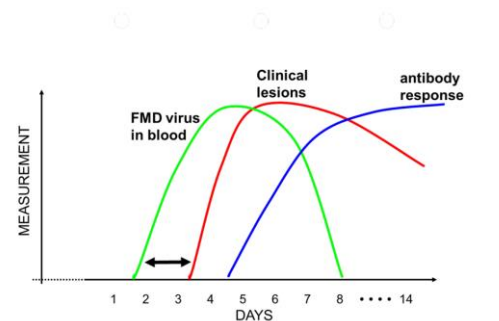
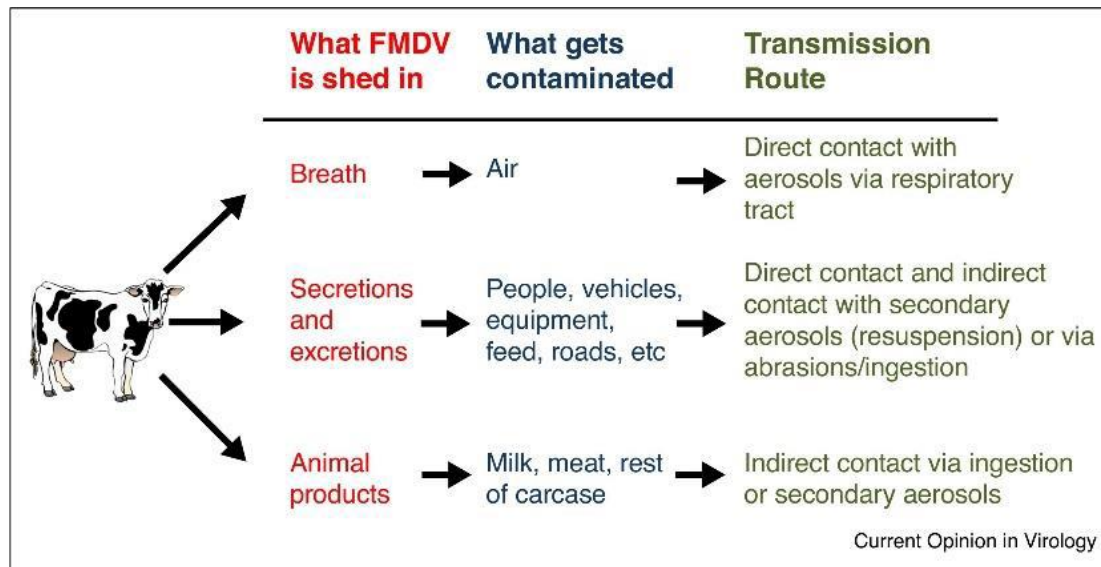


Factors to consider to determine risk factors and implementing questionnaire

Disease of interest - FMD

Knowledge of

- ✓ Disease dynamics
- ✓ Disease transmission
- ✓ Disease progression
- ✓ Disease identification
- ✓ Disease confirmation
- ✓ Country /local context
- ✓ Husbandry system
- ✓ Socio-cultural setting
- ✓ Language
- ✓ Resources (Human , financial)
- ✓ Access to the area



Representative 'in contact' cattle data from Alexandersen et al., 2003 and unpublished data from Pirbright Institute

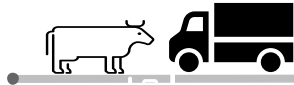
Incubation period is 2–14 days.

For the purposes of the OIE Terrestrial Animal Health Code, the incubation period for FMD is 14 day

DEFINE FACTORS OF INTEREST

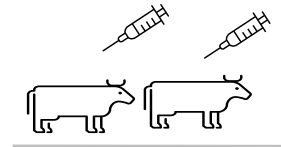
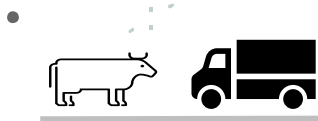
Risk factors associated with the disease and to be tested with the two groups
i.e. case and control .

Purchase of livestock
2 weeks prior to the
outbreak



Grazing **2 weeks**
prior to the
outbreak

Purchase of livestock
12 months prior to
the outbreak



Vaccination of
herd

QUESTIONNAIRE

Outbreak Investigation – Questionnaire Field day 15th August 2018

Village name and **pcode**:

Date of visit:

GPS Coordinates:

District **pcode**:

Village head name:

Township **pcode**:

1. Village-head questionnaire

What is the total livestock population in the village?

Total Cattle

Total Sheep

Total Buffaloes

Total Pig

Total # of households

Total # of households with livestock

When was the last FMD outbreak?

How many households in total were affected by FMD?

How many animals were affected by FMD?

Cattle FMD:

Sheep FMD:

Buffalo FMD:

Pig FMD:

For the following questions, ask open questions, let people tell the story, lead the discussion

When was the first FMD case observed? Who/where was the index household?

When was the last case of FMD seen?

MEASURE FMD

FMD case definition (household level): salivation AND/OR lameness AND lesions on the mouth/teats/feet. Check the villagers understand the case definition

1.1. Measure FMD

Did you ever have FMD in your household?

If yes, when was it the last time?

What is the total number of livestock in your household?

Total Cattle

Total Sheep/goats

Total Buffaloes

Total Pig

How many animals were affected by FMD during the last outbreak in your household?

Cattle with FMD:

Sheep/goats with FMD:

Buffalo with FMD:

Pig with FMD:

RISK AND PROTECTIVE FACTORS

2.2 Risk and protective factors

Do you vaccinate cattle/buffaloes against FMD?

Did you purchase livestock in 2 weeks prior FMD onset?

If yes, how many, what species, from where did you purchase?

Did you purchase livestock in the last year?

If yes, how many, what species, from where did you purchase?

Do you usually use free grazing? If yes, which months of the year?

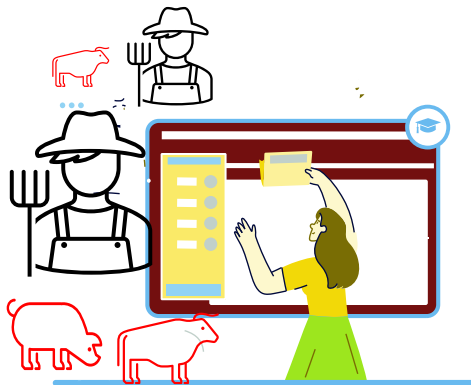
Did you use free grazing in the 2 weeks prior the onset of FMD?

SELECTION OF CASE CONTROL HHs

- HH information to be collected in relation to livestock, affected species, numbers and risk factors, introduction and spread of FMD.
- Selection of the cases (HH with FMD during outbreak) and control (HH without FMD during time of outbreak) from the same village.
- The selection of control HHs was convenient: farmers who were present at the houses when the team was visiting.
- Case control ratio ideally 1: 1 ? At field situation was 11 : 3
- Matching , unintended or overmatching factors and biases

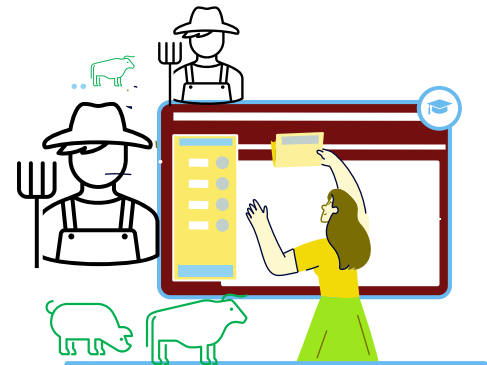
CASE VS CONTROL

Cases (presence of FMD) and Control (absence of FMD) from source population



Cases
(55 HH)

68
Households



Control
(13 HH)

ODDS RATIO

An odds ratio (OR) is a measure of association between an exposure and an outcome. The OR represents the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure

>1



If the Odds ratio is more than 1

Means risk factor is positively associated with the disease.

1



If the odds ratio is **not** different from 1

Means risk factor is not associated with the disease

<1



If the odds ratio is less than 1

Means risk factor is protective for the disease

RISK FACTORS AT HH (RETROSPECTIVE)

- The grazing 2 weeks prior to outbreak **increases the risk of FMD five folds at HH.** (P value= 0.008)
- FMD vaccination factor odds ratio 0.09 suggest that vaccination is a highly **protective factor** for the households against FMD. (P value =0.009)

Table : Risk and protective factors for the observation of clinical FMD in 68 HH (55 cases and 13 controls)

Odds Ratio Calculation								
	HH with FMD (Cases)			HH without (Controls)			Odds Ratio (ad/bc)	P value
Factors of interest	Exposed (a)	Not exposed c)	Total (a+c)	Exposed (b)	Not exposed (d)	Total (b+d)		
Purchase of livestock 2 weeks before outbreak	4.5	51.5	56	0.5	13.5	14	2.36	0.562
Purchase of livestock 12 months before outbreak	6	49	55	1	12	13	1.47	0.731
Vaccination	29	26	55	12	1	13	0.09	0.009
Grazing 2 weeks prior to outbreak	42	13	55	5	8	13	5.17	0.008

REPORT AND COMMUNICATE FINDINGS

Retrospective FMD Outbreak Investigation Report August -September 2018

Chapter	Title	Page number
1	Context	2
2	The rationale for the retrospective investigation	3
3	Investigation team and schedule	3
4	Methods and case definition	3
5	Outcomes	4
5.1	Village level	4-5
5.2	Household level	6
5.3	Risk Factors	7
5.4	FMD virus introduction	8
5.5	FMD virus spread	8
5.6	Control measures	9
6	Conclusion	10
7	Appendices	10



- Appendix 1: DLF's FMD outbreak data
- Appendix 2; Household and village level questionnaire (English version)
- Appendix 3: Data entry of the questionnaire.
- Appendix 4: OR template sheet.
- Appendix 5: Retrospective outbreak investigation images.
- Appendix 6: Draft OPF sample results (real time PCR)

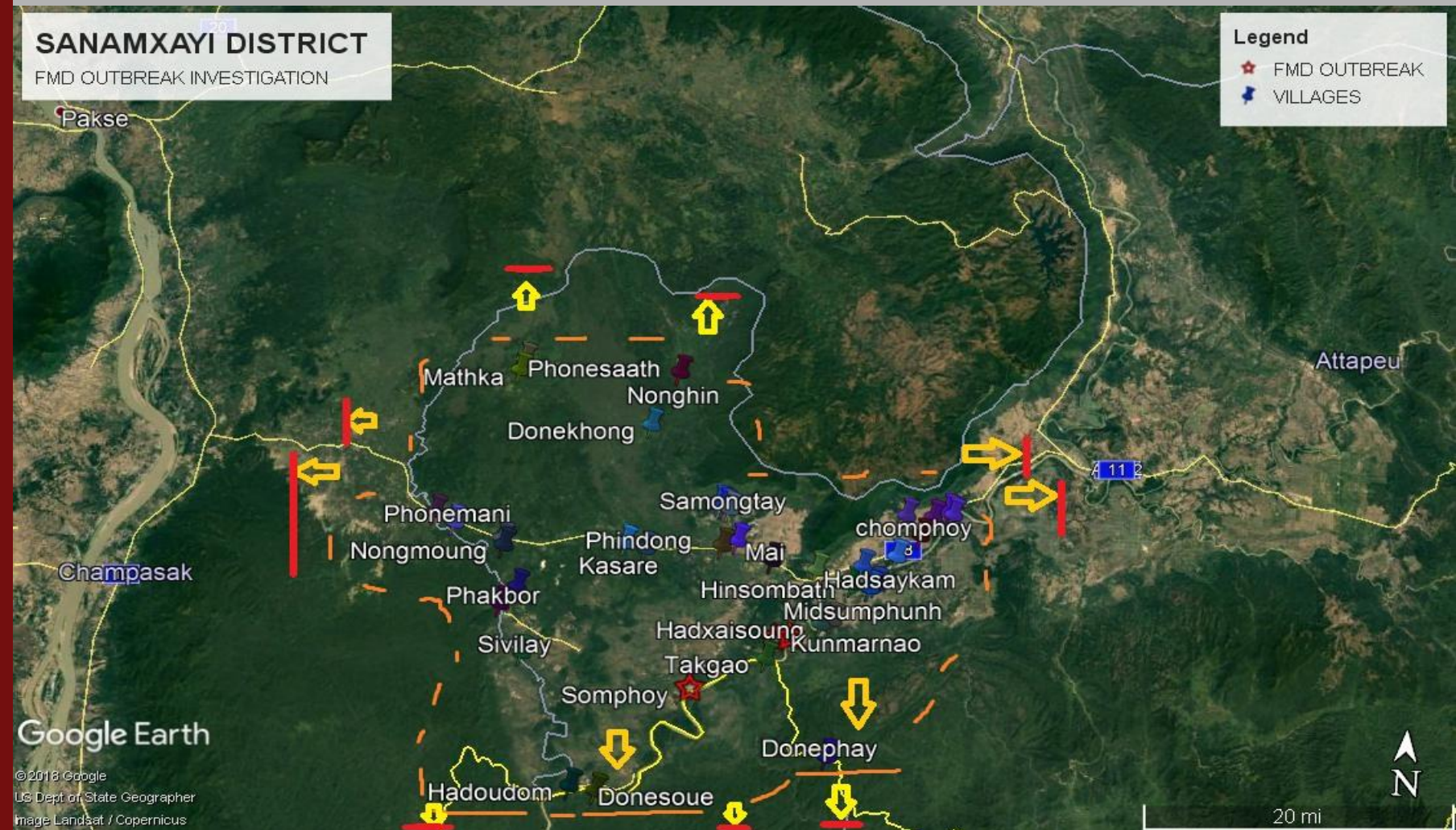
CONTROL STRATEGIES

SANAMXAYI DISTRICT

FMD OUTBREAK INVESTIGATION

Legend

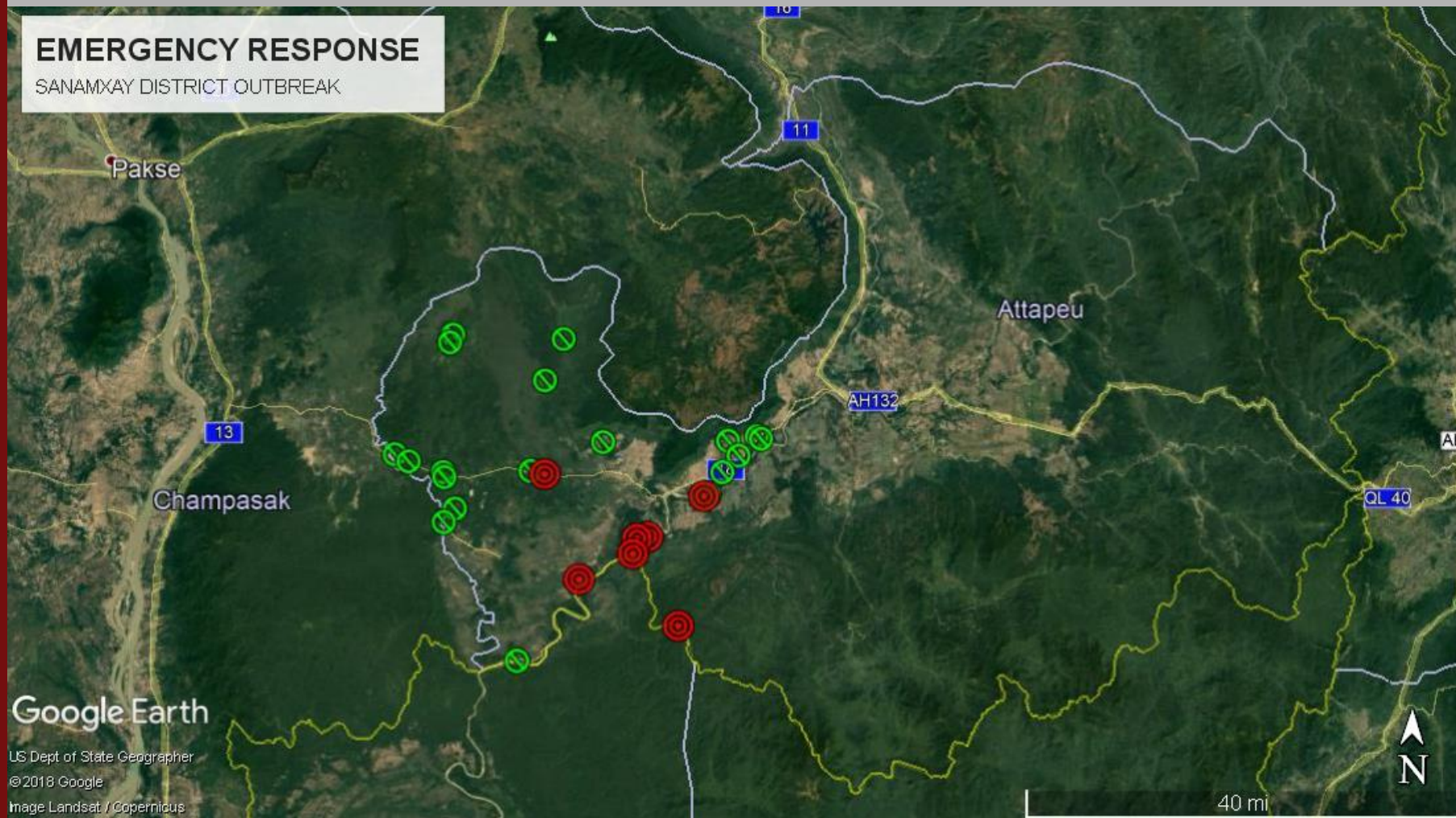
- ★ FMD OUTBREAK
- 📍 VILLAGES



RING VACCINATION

EMERGENCY RESPONSE

SANAMXAY DISTRICT OUTBREAK



BETTER PLANNING EXAMPLE

Discussions on case- control

- The case definition is important step to identify and understand the disease for both interviewee (farmers) and interviewer (investigation team) during case control study.
- Understanding how disease moves between animals to determine the sources of infection and factors determining transmission.
- Recall and selection bias may influence case control study findings, particularly when farmers are asked to recall old outbreaks.
- Operational resources, access and availability of farmers may influence the selection of number of cases and control i.e., case control ratio particularly during investigation.
- Odds ratio helped to determine where a particular exposure is a risk or protective factor for the outcome (Disease i.e. FMD) .
- Additionally, the size of the OR for different risk factors reflects their importance.

Discussions

- Xayabully:
 - grazing 2 weeks prior to outbreak increased the risk of FMD five-fold.
 - FMD vaccination odds ratio of 0.09 suggest that vaccinated HHs were 11 times less likely to observe FMD.
- Other experiences in Attapeu Investigation also suggest :
 - grazing 2 weeks prior to the outbreak increased the risk five-fold.
 - vaccination was implemented by 2 case-HHs implied that the vaccine was ineffective, but the time of vaccination was unclear.
- Case control studies can be useful for the investigation of outbreaks to understand risk factors and inform control strategies.
- Getting people participating in case control investigations engage veterinary services closely with the communities which benefits emergency control measures.
- The design and implementation of such investigations is relatively inexpensive.

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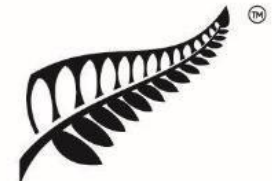
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THANK YOU FOR YOUR ATTENTION



Dr Ashish SUTAR
OIE Project Officer
a.sutar@oie.int



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12, rue de Prony, 75017 Paris, France
www.oie.int
media@oie.int - oie@oie.int

