# PREVALENCE OF LEPTOSPIROSIS AND THE ROLE OF CLIMATIC FACTORS AND AGRICULTURAL PRACTICES IN ITS CIRCULATION IN VIETNAM

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NIHE

Institut Pasteur

NIHE

international network Institut Pasteur

WP VIETNAM

# GENERAL OBJECTIVES

1. **Describe epidemiological status of Leptospirosis in Vietnam**
2. **Define risk factors of Leptospirosis in varied social-economic and climate areas.**

# SPECIFIC OBJECTIVES

1. To estimate the **incidence** of Leptospirosis in hospitalization patients in selected areas in Vietnam
2. To describe the main ***Leptospira* serogroups** circulating in human and animal
3. To identify the main **risk factors** associated for Leptospirosis transmission
4. To improve **capacity** in laboratory testing, clinical diagnosis and management of Leptospirosis for participating institutions i.e. hospitals, provincial preventive medicine center and NIHE.
5. To improve **inter-sectoral collaboration** between health, veterinary and environmental authorities/private sectors

# METHODOLOGY

## MULTIPLE METHODOLOGY


Hospital-based surveillance in catchment area

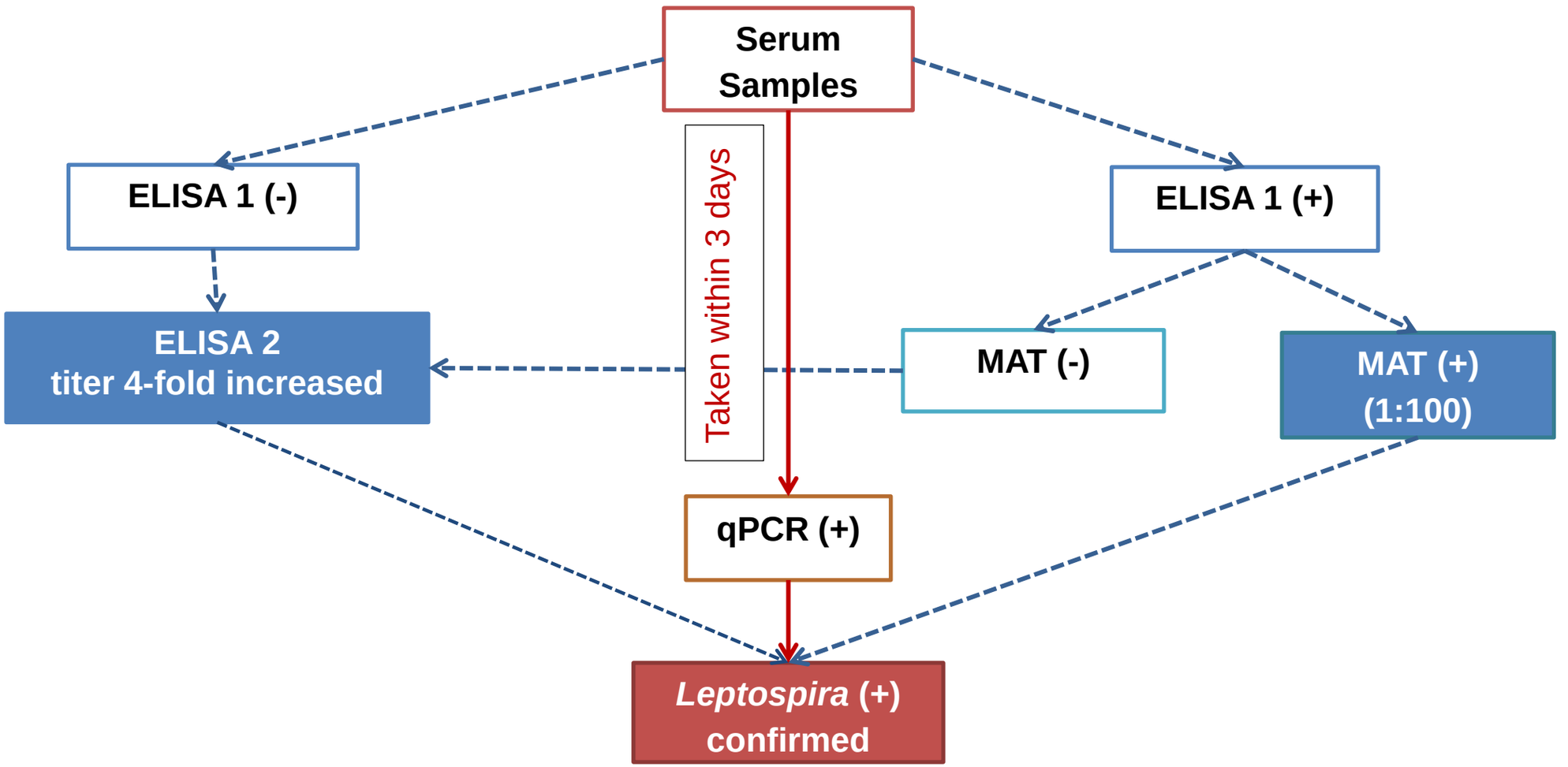
Serology cross-sectional survey in animal and human

Community-based case – control study

Combination of Training – Meeting/Workshop – Document development

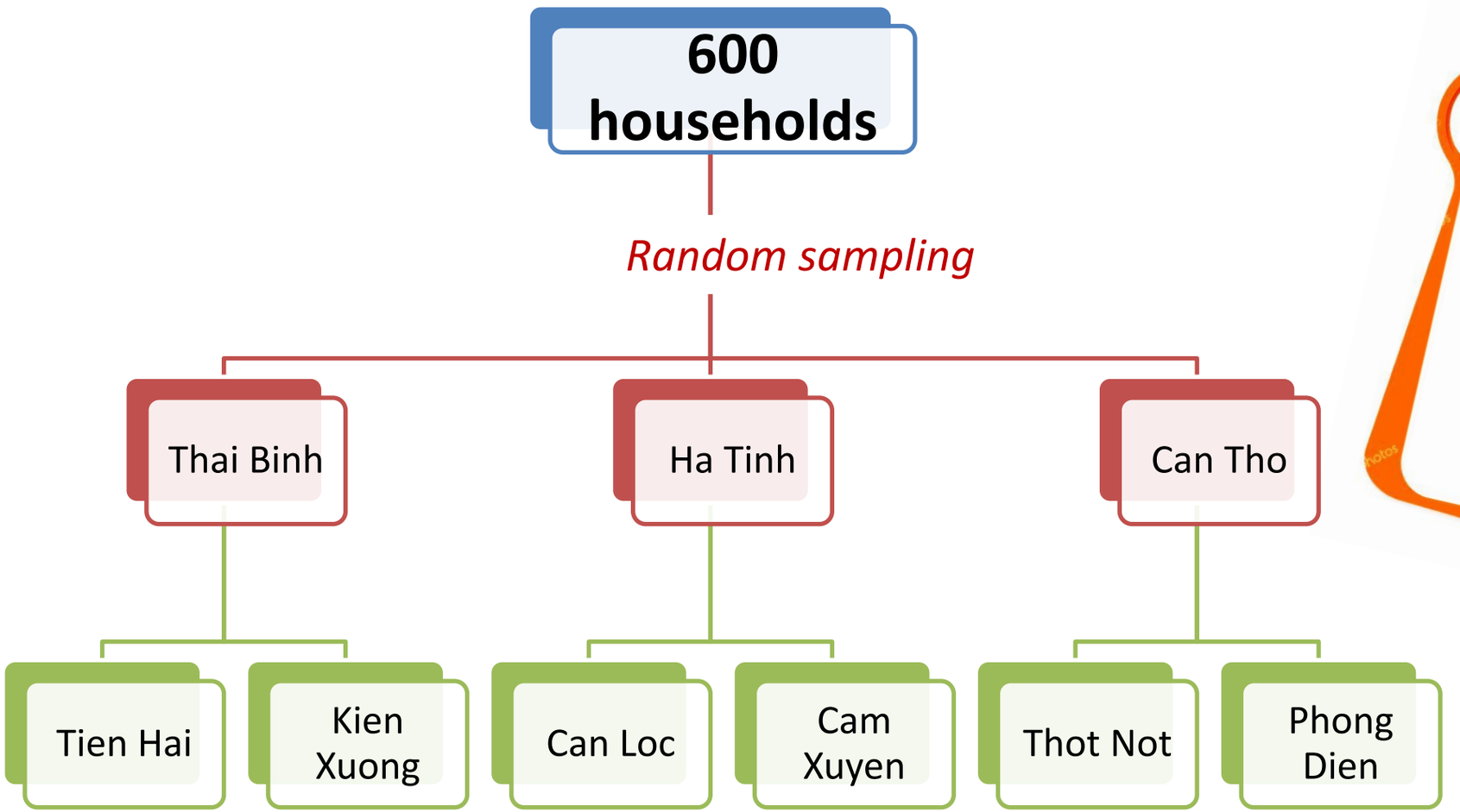
# PROTOCOL REVISION

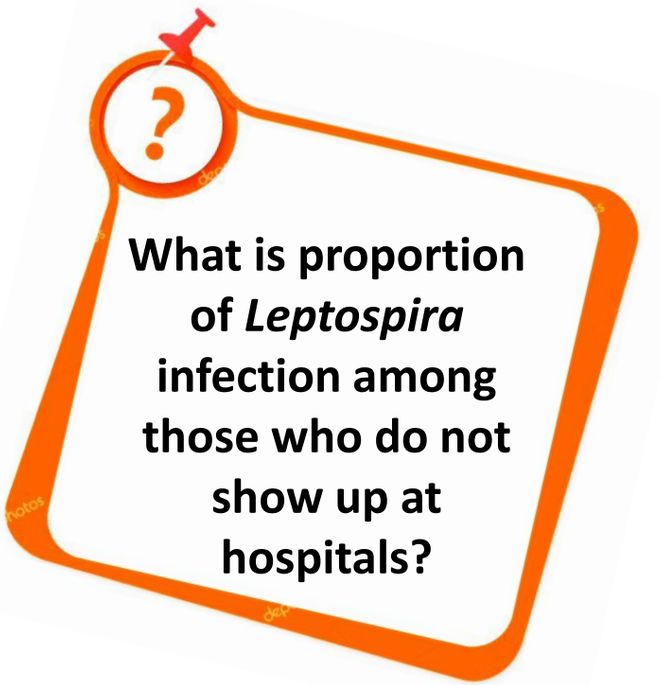
## 1. Revised Diagnosis Test Algorithm



# PROTOCOL REVISION

## 2. Added serology survey in human community



# PROTOCOL REVISION

## 3. Diversified types of animal to be sampled

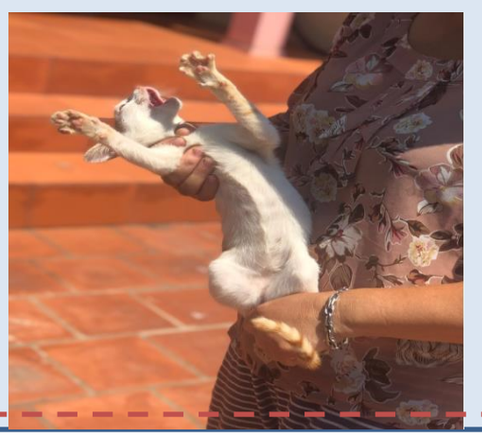
Pig

Cow

Dog

Buffalo

Cat

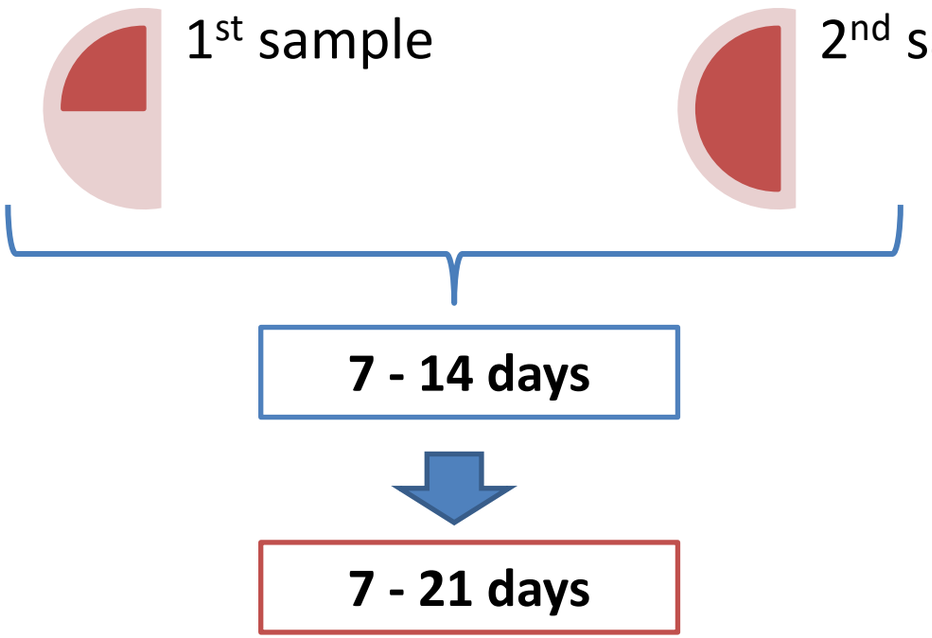


Rat

**1,200 samples**

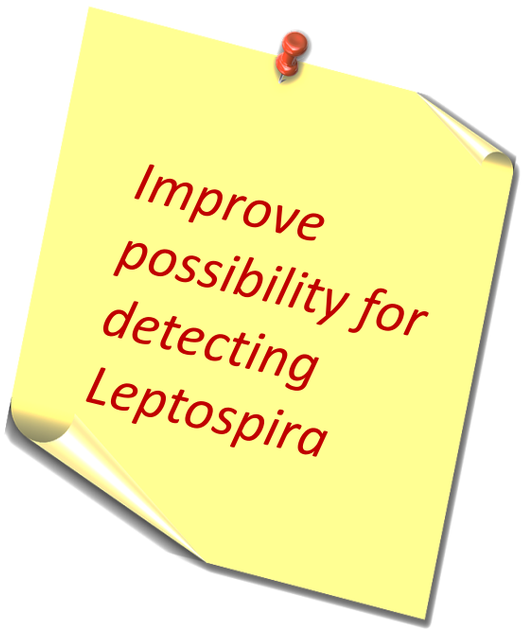
# PROTOCOL REVISION

## 4. Extended interval between the 1st and 2nd sampling




# PROTOCOL REVISION

## 5. Changed MAT testing scheme



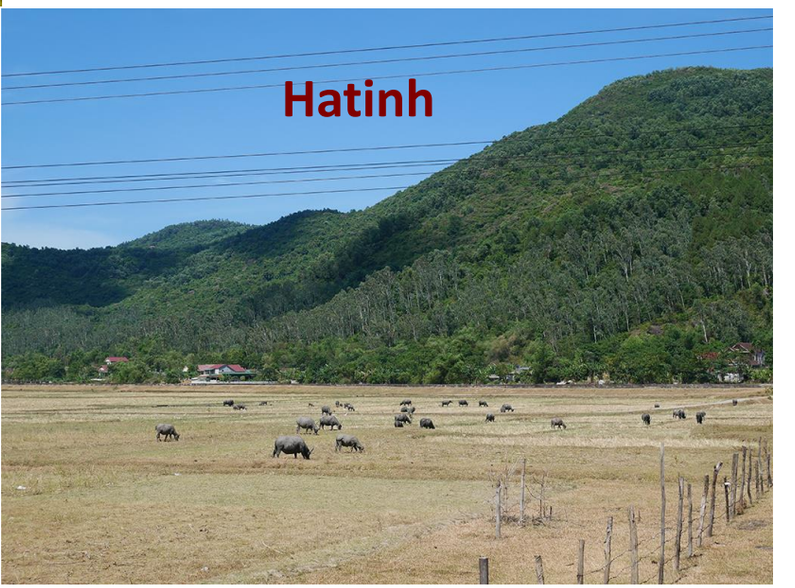

Testing in 1st sample → Testing in 2nd sample, if available

# PRELIMINARY

# #1. Hospital-based surveillance – Study sites


- ✓ **1.138** inhabitant/km²
- ✓ Rural Population: **89.5%**
- ✓ 1st largest rice field area in the North of Vietnam
- ✓ **Humidity**

- ✓ **205** inhabitant/km²
- ✓ Rural Population: **81.8%**
- ✓ Lowland vs. Mountain
- ✓ **Drought vs. Flooding**





- ✓ **885** inhabitant/km²
- ✓ Rural Population: **33%**
- ✓ Canal and river interlacing system
- ✓ **Dry vs. Rainy seasons**

# #1. Hospital-based surveillance

***Study sites***

- **12 => 11** provincial and district hospitals capturing population from **6** districts included

***Timeline:***

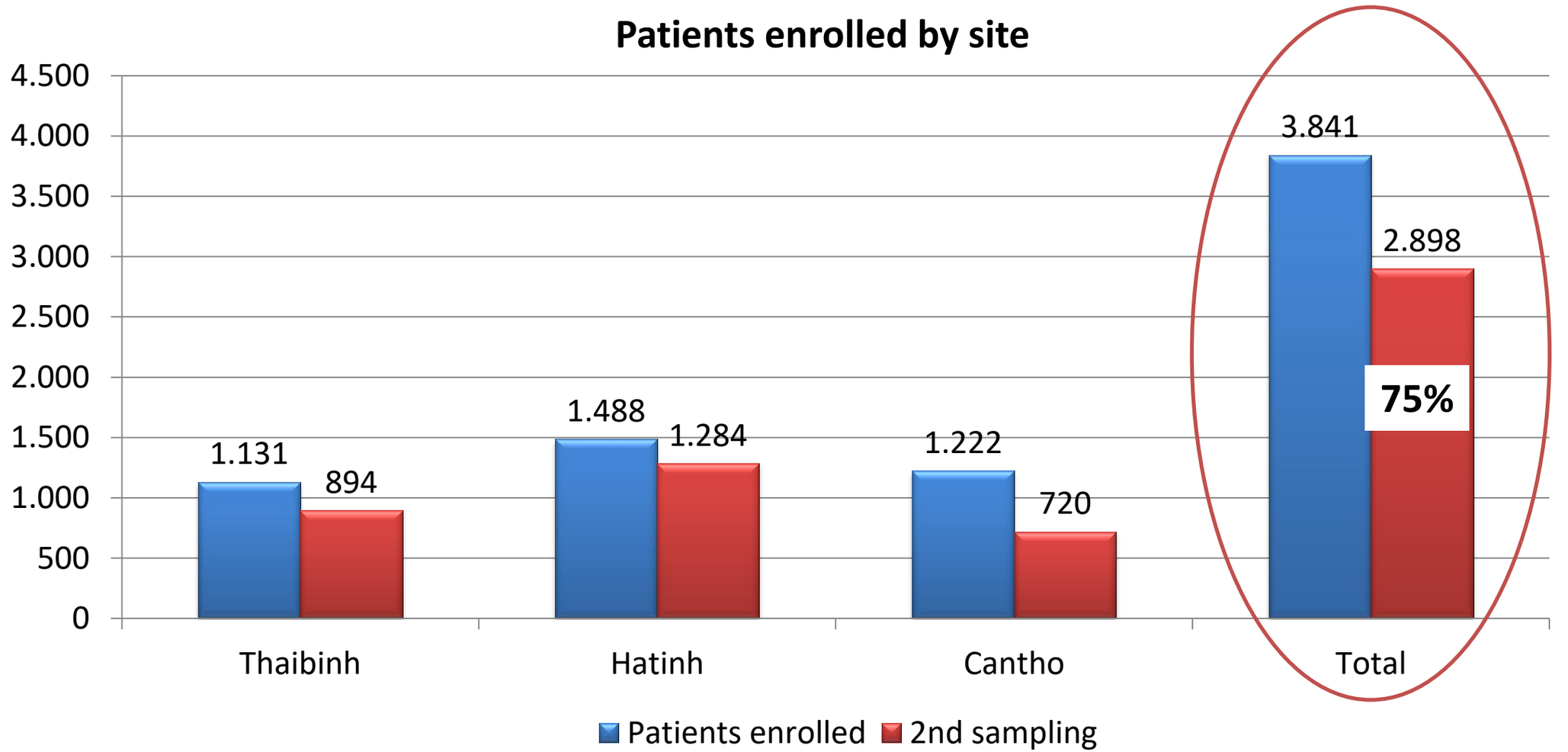
**1 Oct. 2018 - 31 Oct. 2019**




***INCLUSION CRITERIA***

- Fever or history of fever during last 5 days **AND** at least **TWO** of the following:
  - Myalgia (calf muscles)
  - Headache
  - Jaundice
  - Conjunctival Suffusion (Bilateral)

# #1. Hospital-based surveillance



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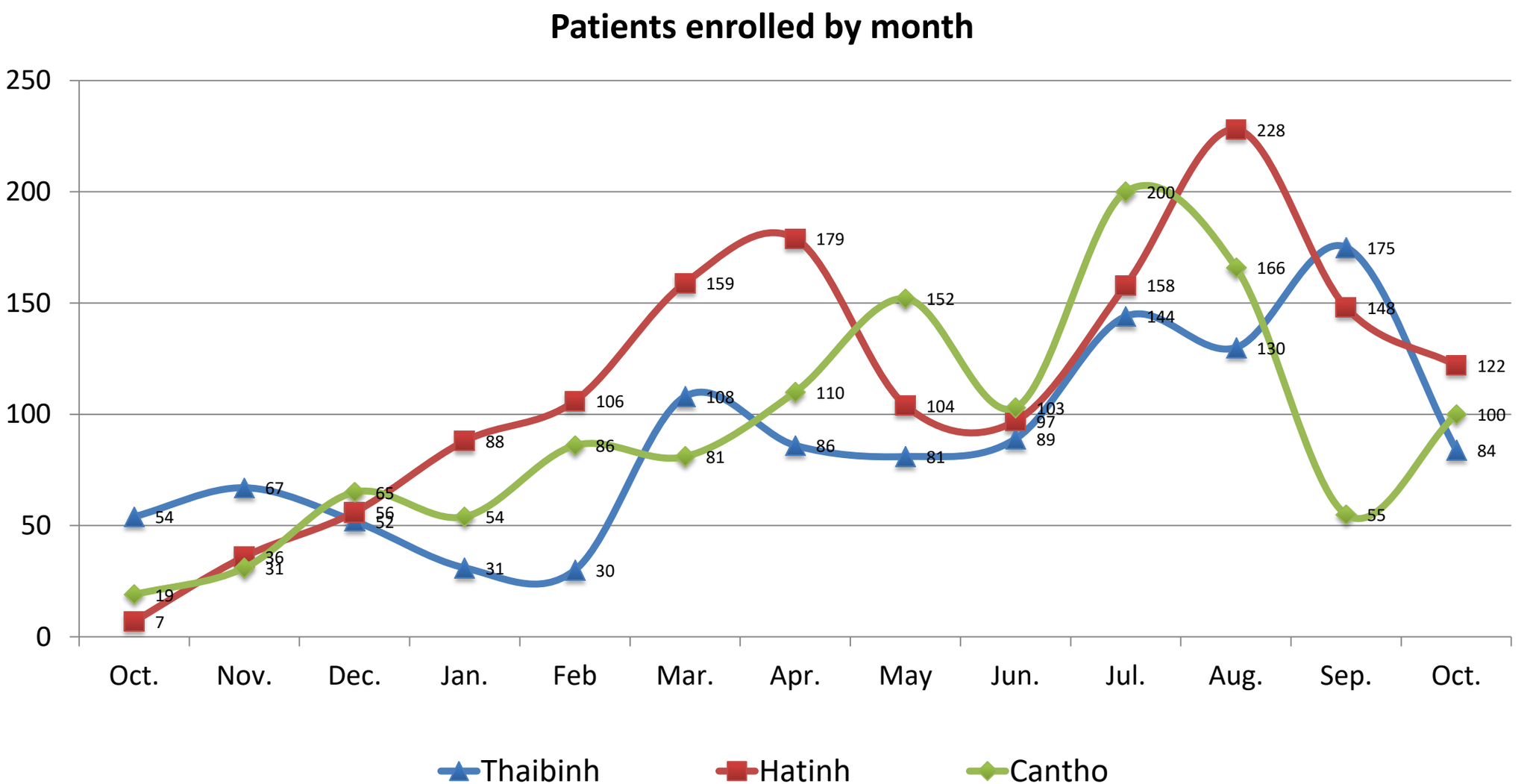
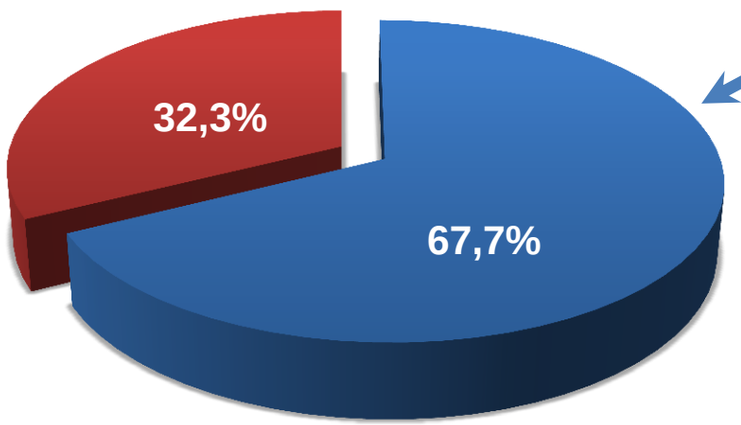
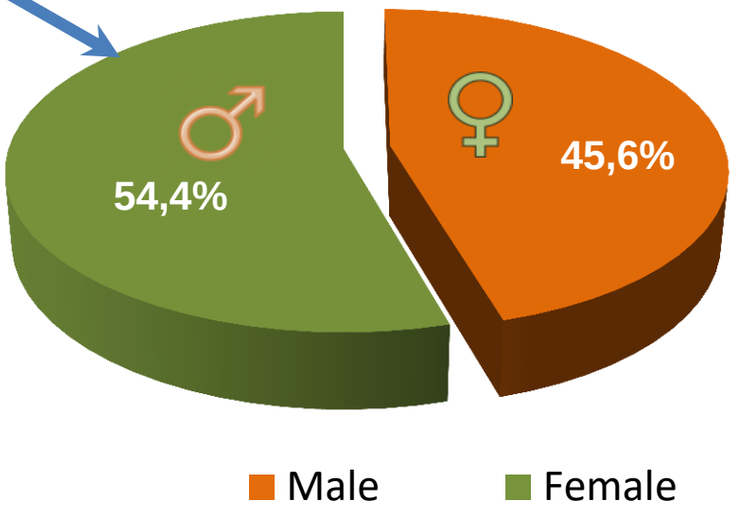


# #1. Hospital-based surveillance

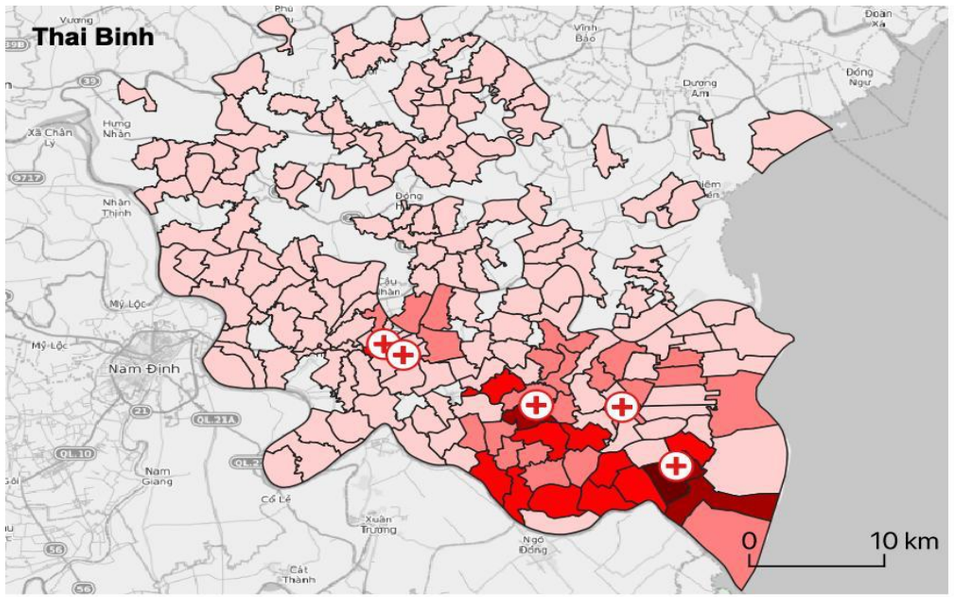
**2910 suspected cases enrolled**

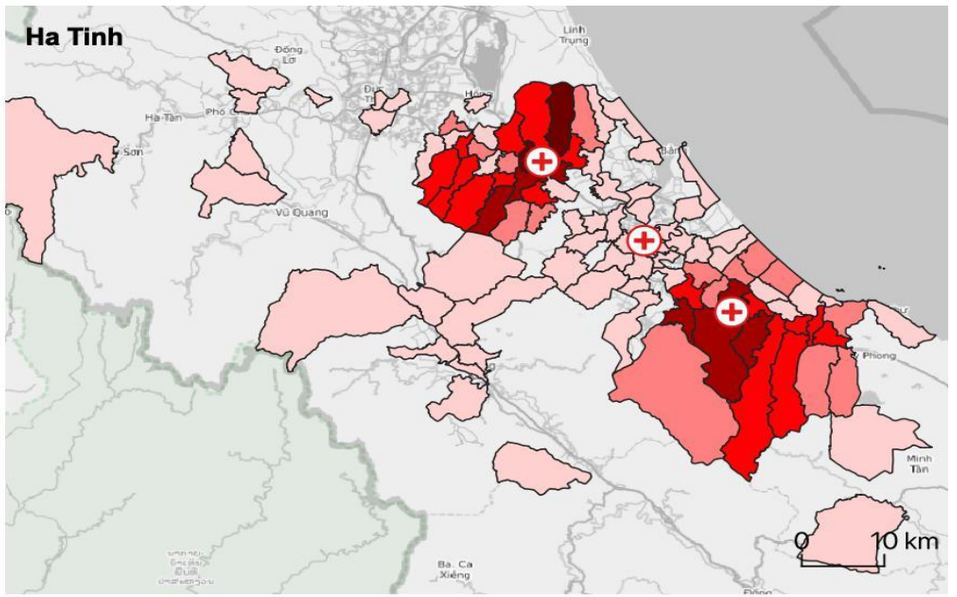


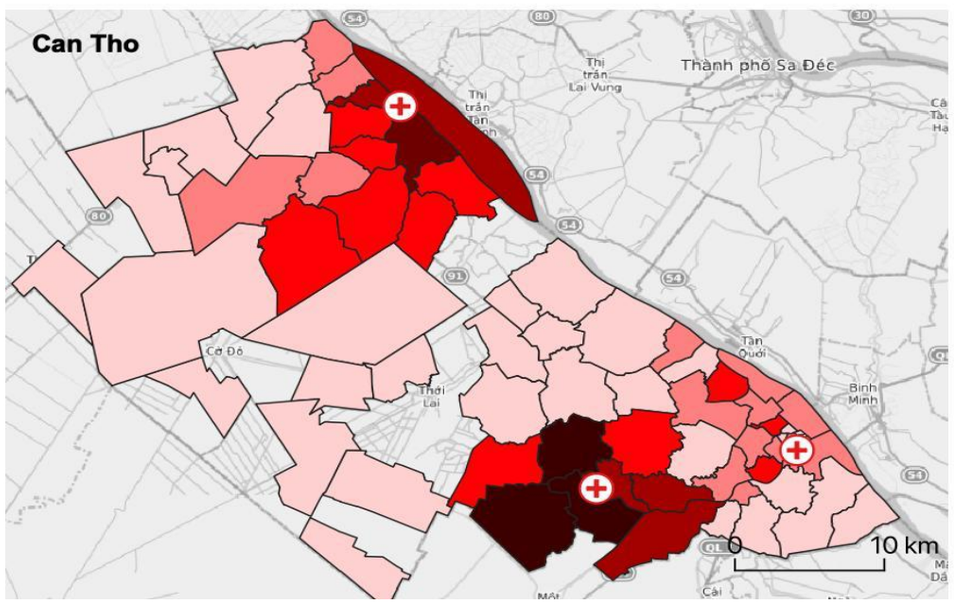




| | |
|---|---|
| **Days from onset to hospital visit** | **4.0 days** (ranged from 1 - 42) |
| **Average age** | **43.3 years old** (ranged from 4.6 - 102) |

# #2. Community-based case-control study




Hospitals

Number
0
0 - 5
5 - 10
10 - 20
20 - 40
40 - 80
80 - 160

Background @ OpenStreetMap Contributors

# #2. Community-based case-control study

| | PCR | | Paired ELISA | | MAT | | Total confirmed cases |
|---|---|---|---|---|---|---|---|
| | No. tested | No. confirmed | No. tested | No. confirmed | No. tested | No. confirmed | |
| Thaibinh | 158 | **8** | 117 | **6** | 261 | **74** | **87** |
| Hatinh | 199 | **4** | 568 | **28** | 364 | **100** | **130** |
| Cantho | 141 | **1** | 237 | **1** | 295 | **62** | **63** |
| **Total** | 498 | **13** | 922 | **35** | 920 | **236** | **280** |

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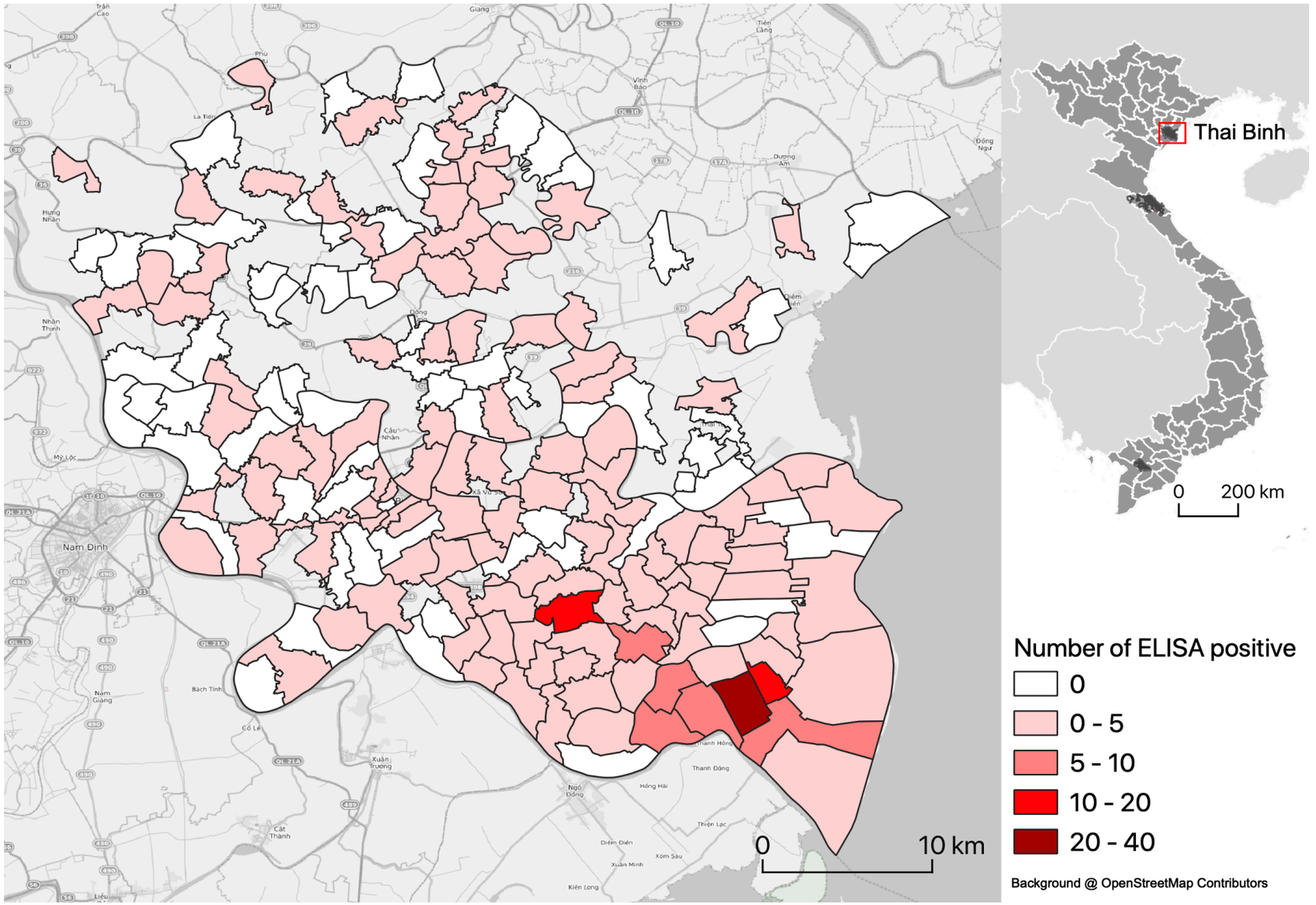

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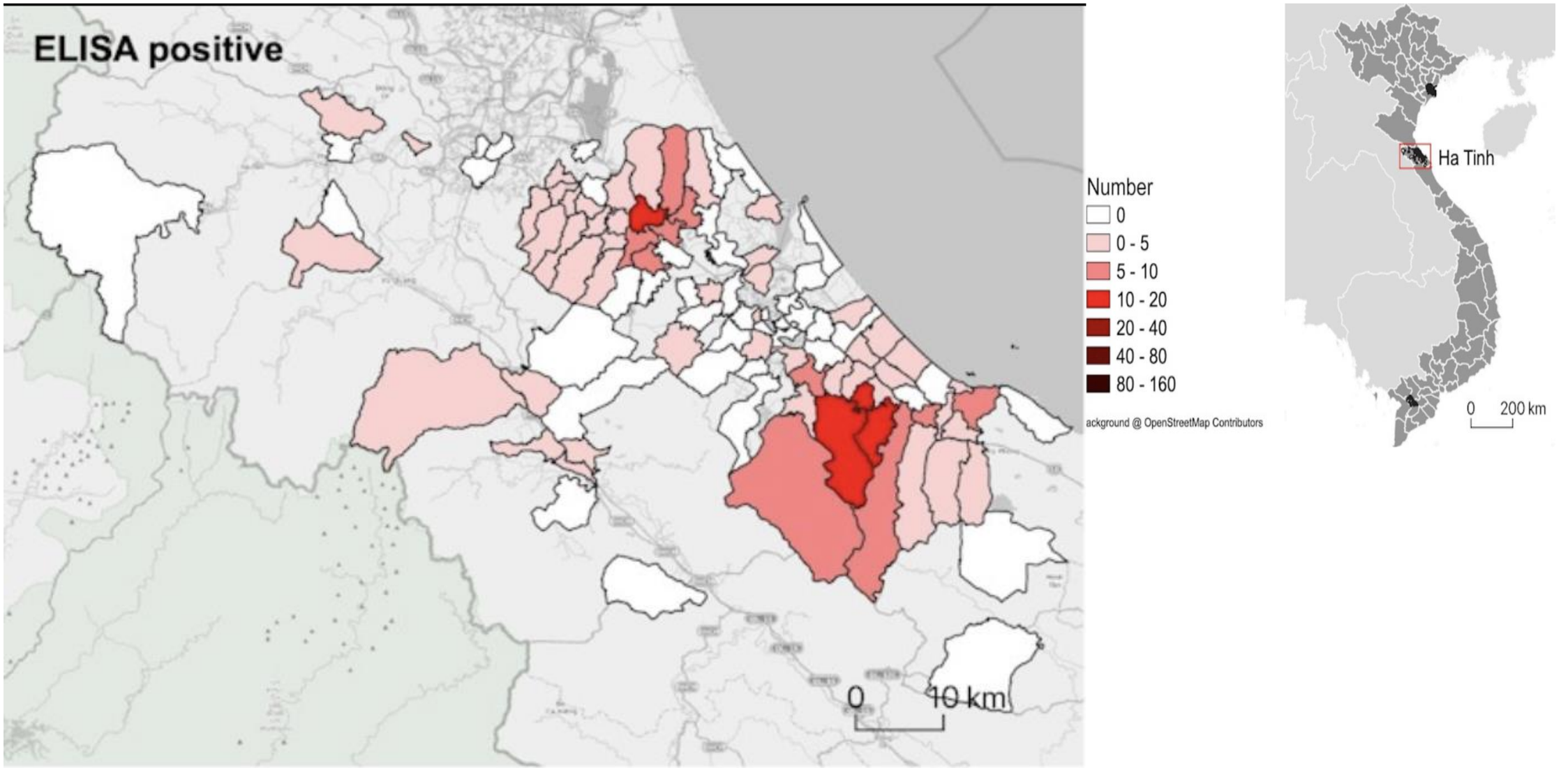

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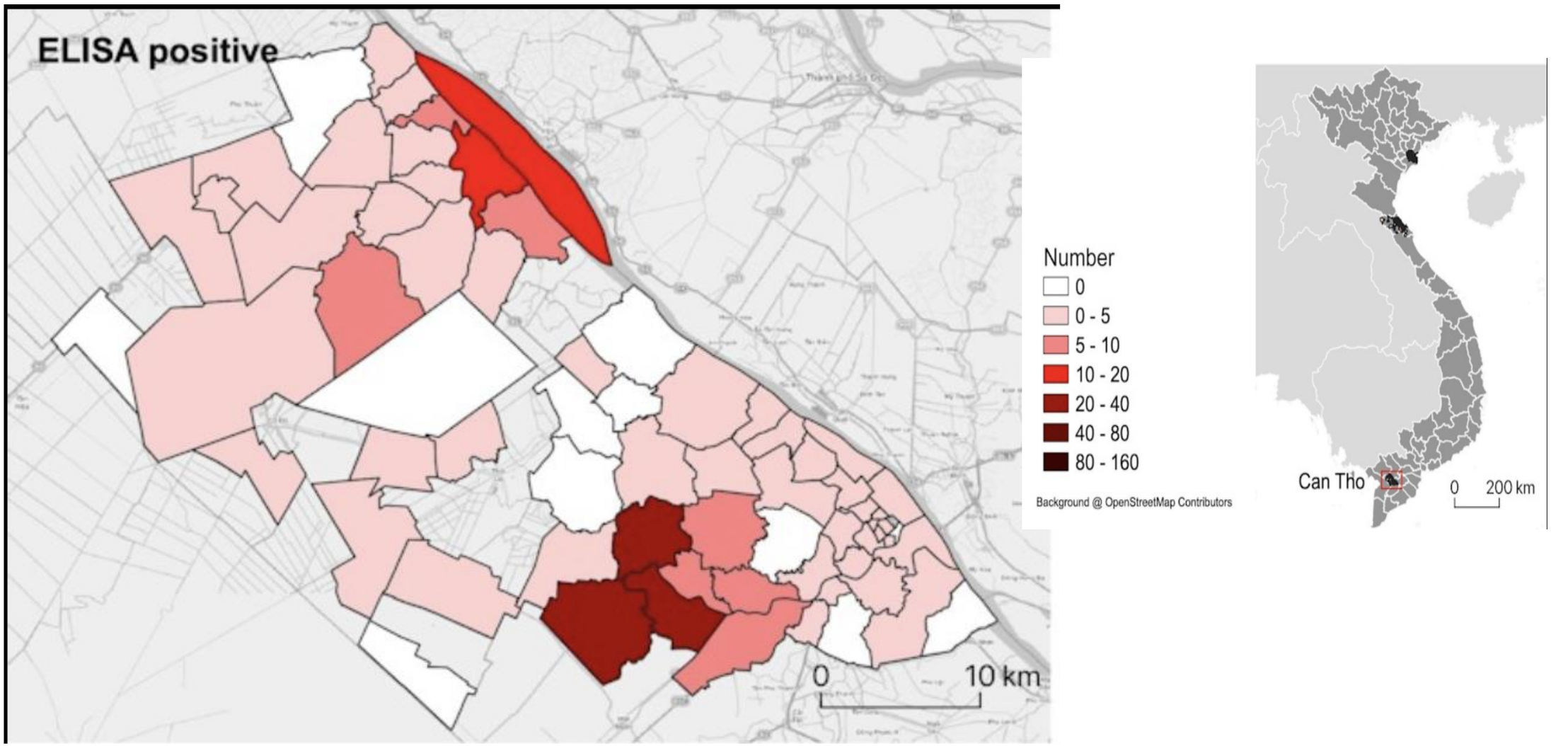

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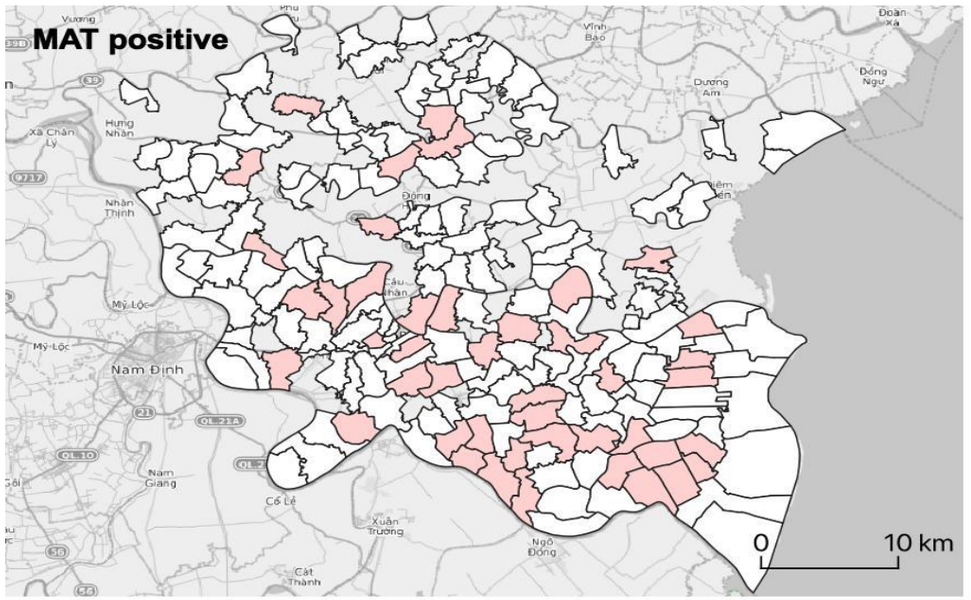


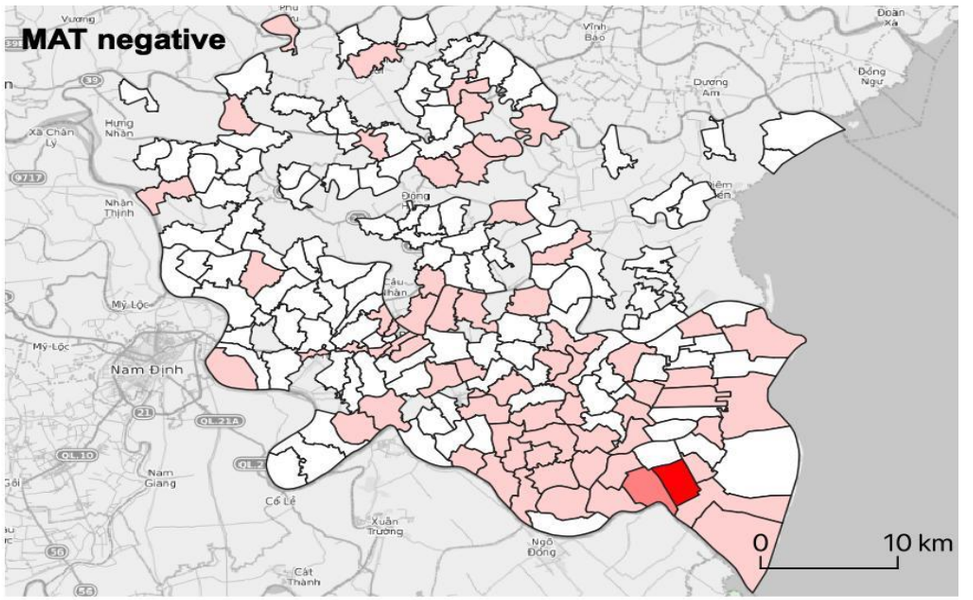


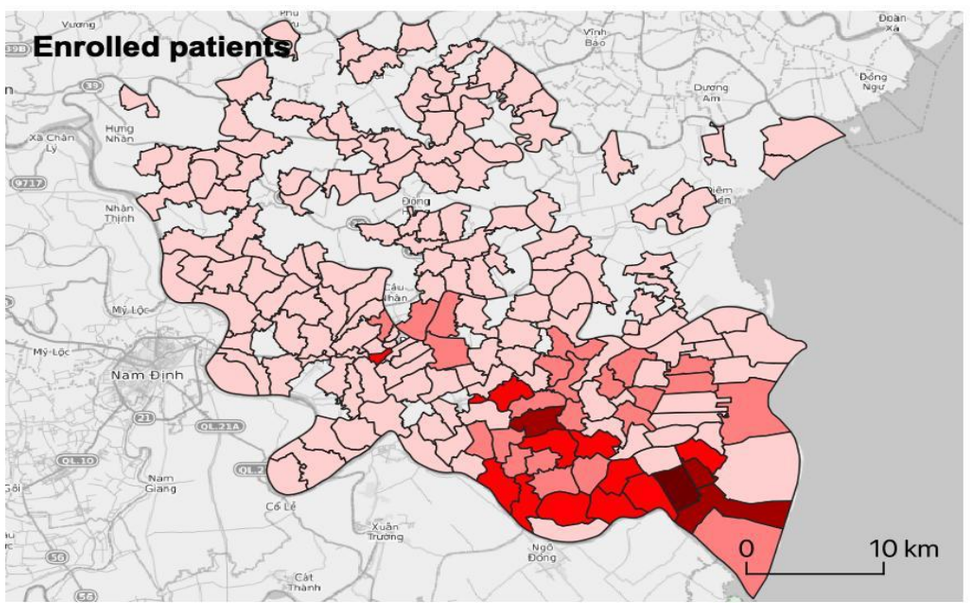


Number
0
0 - 5
5 - 10
10 - 20
20 - 40
40 - 80
80 - 160

Background @ OpenStreetMap Contributors

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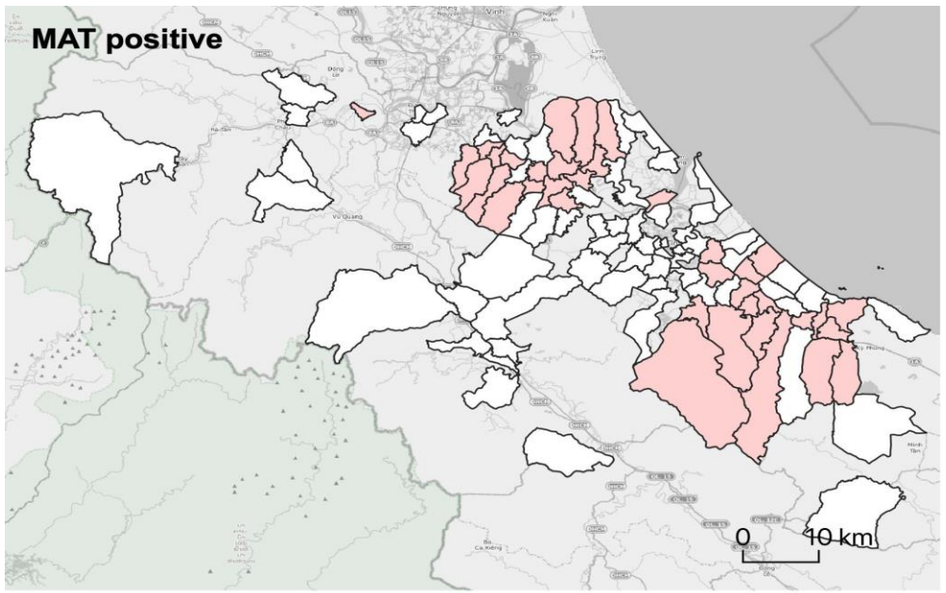


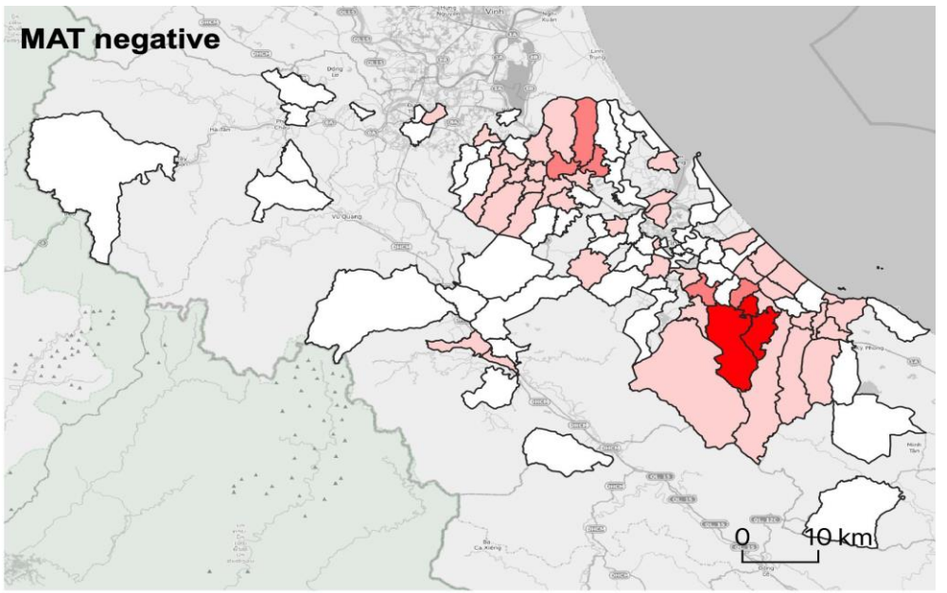


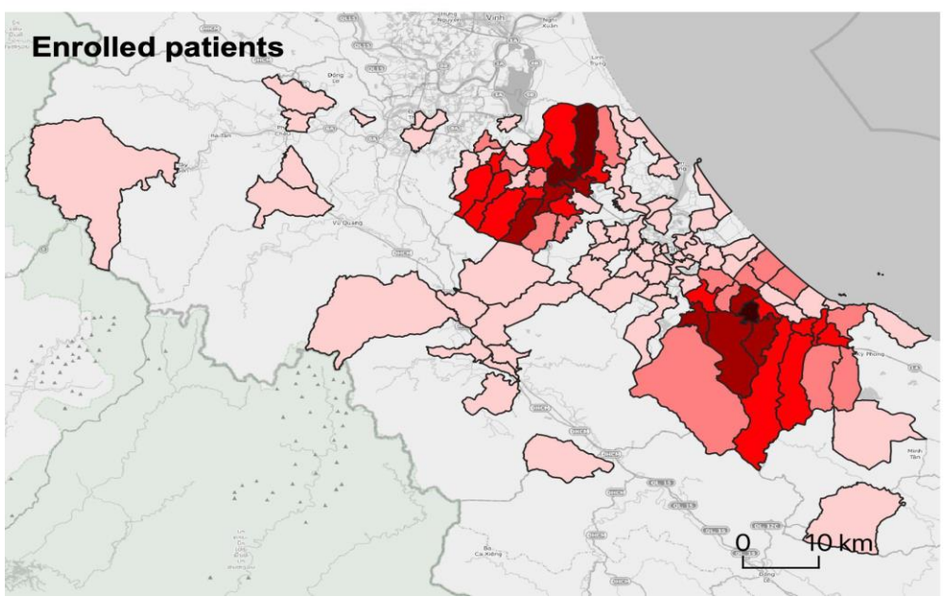


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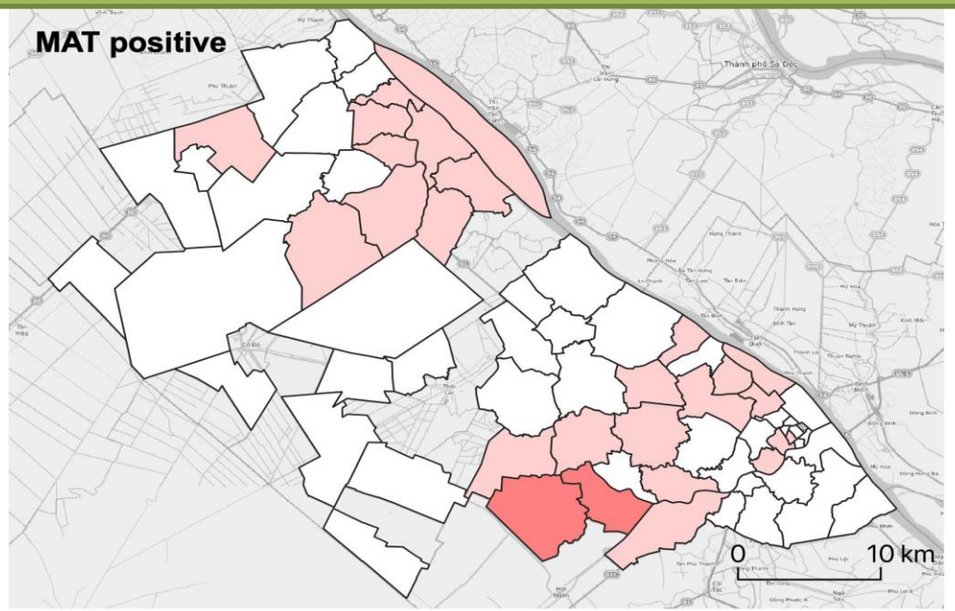


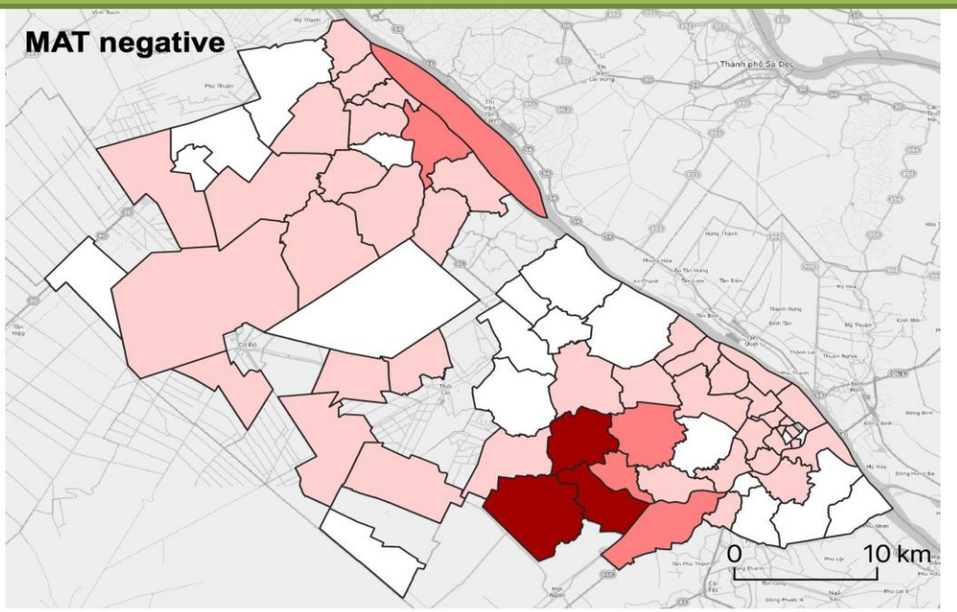


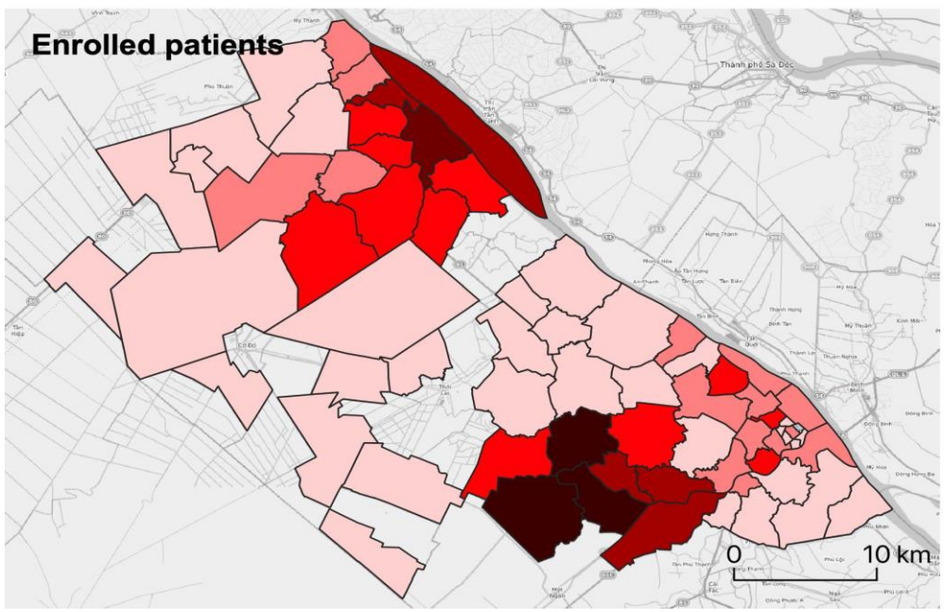


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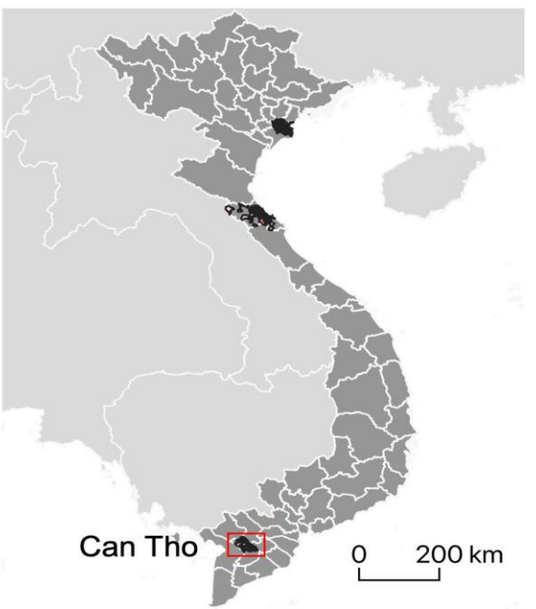

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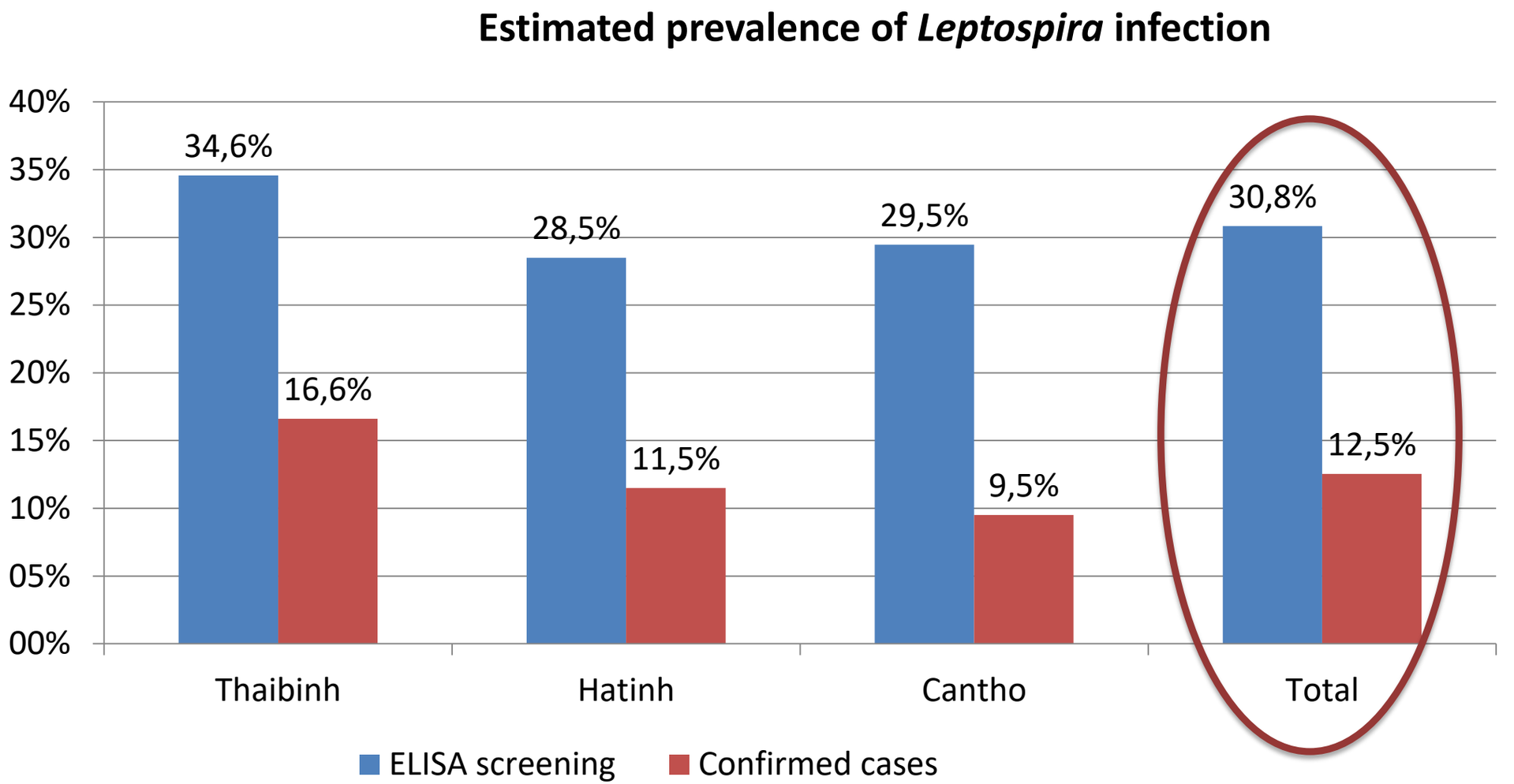

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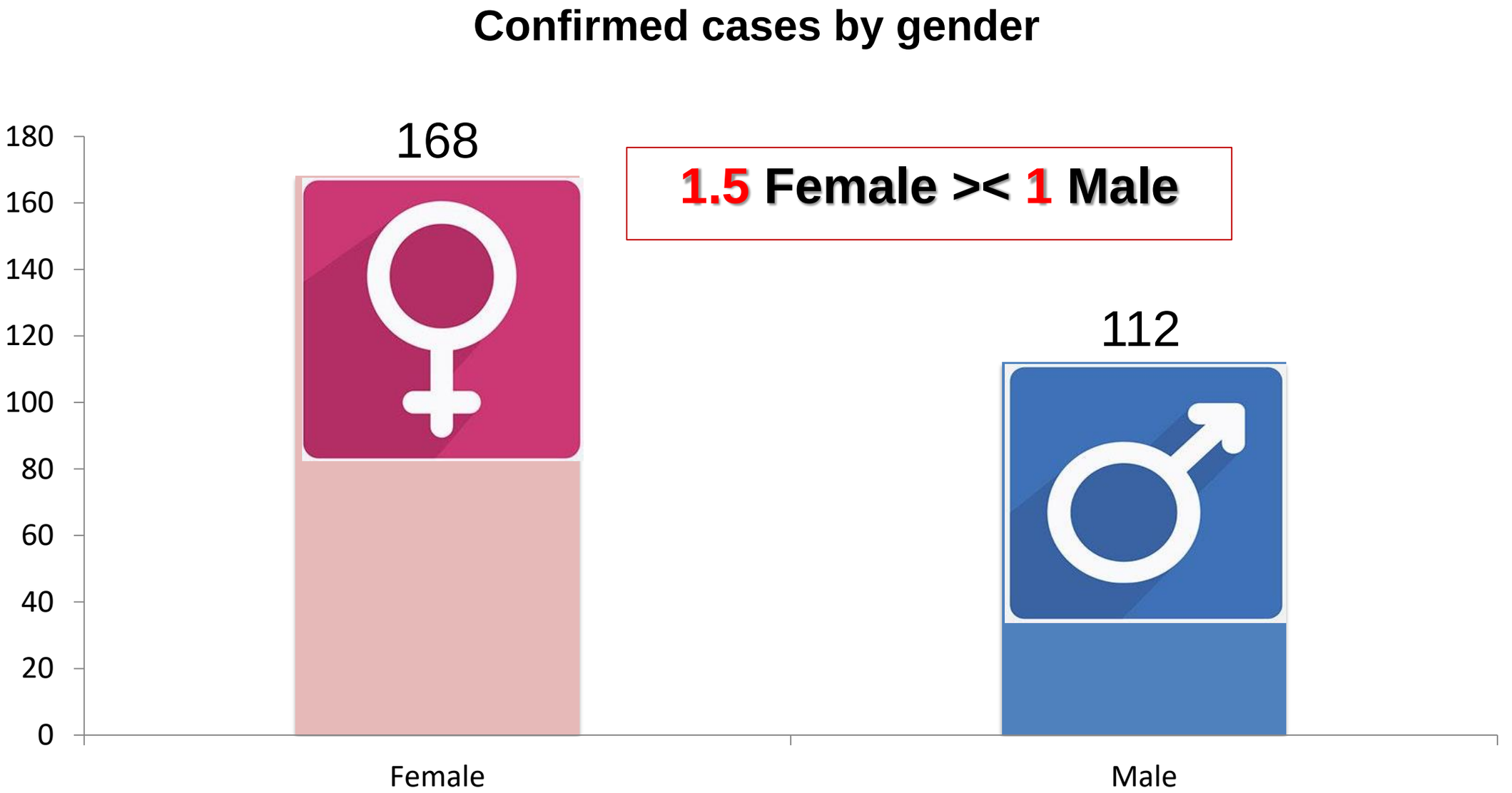

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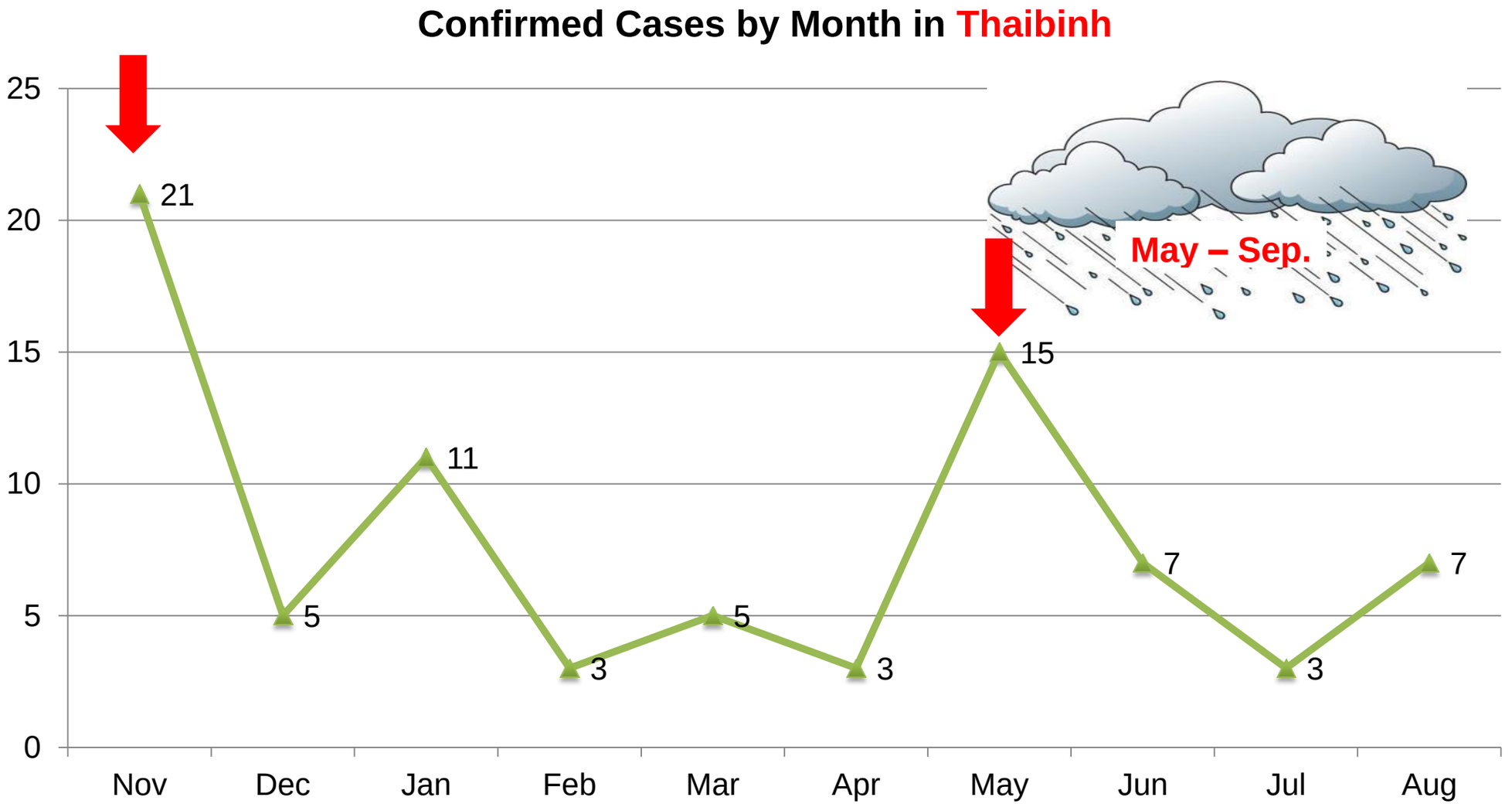

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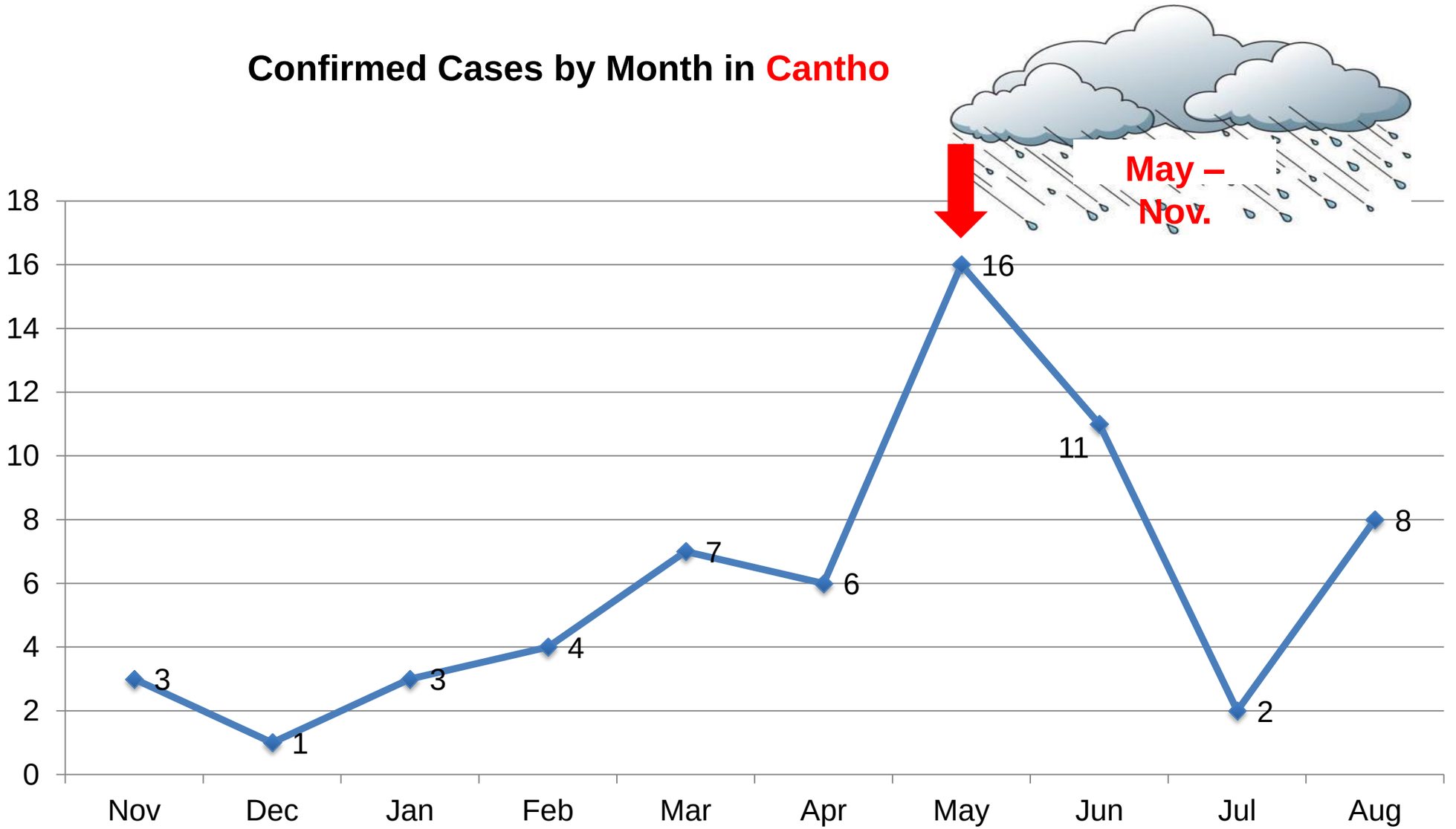

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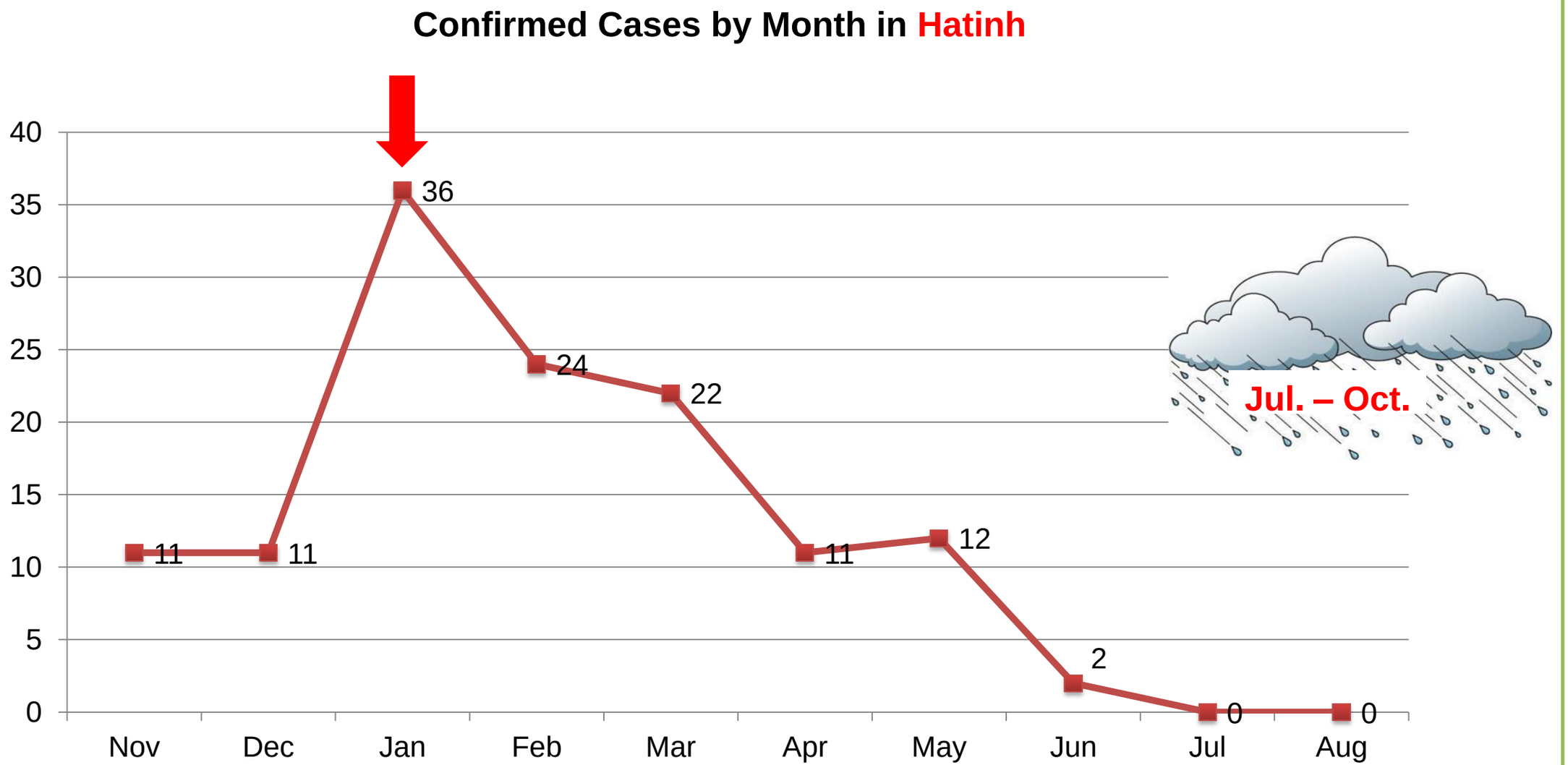

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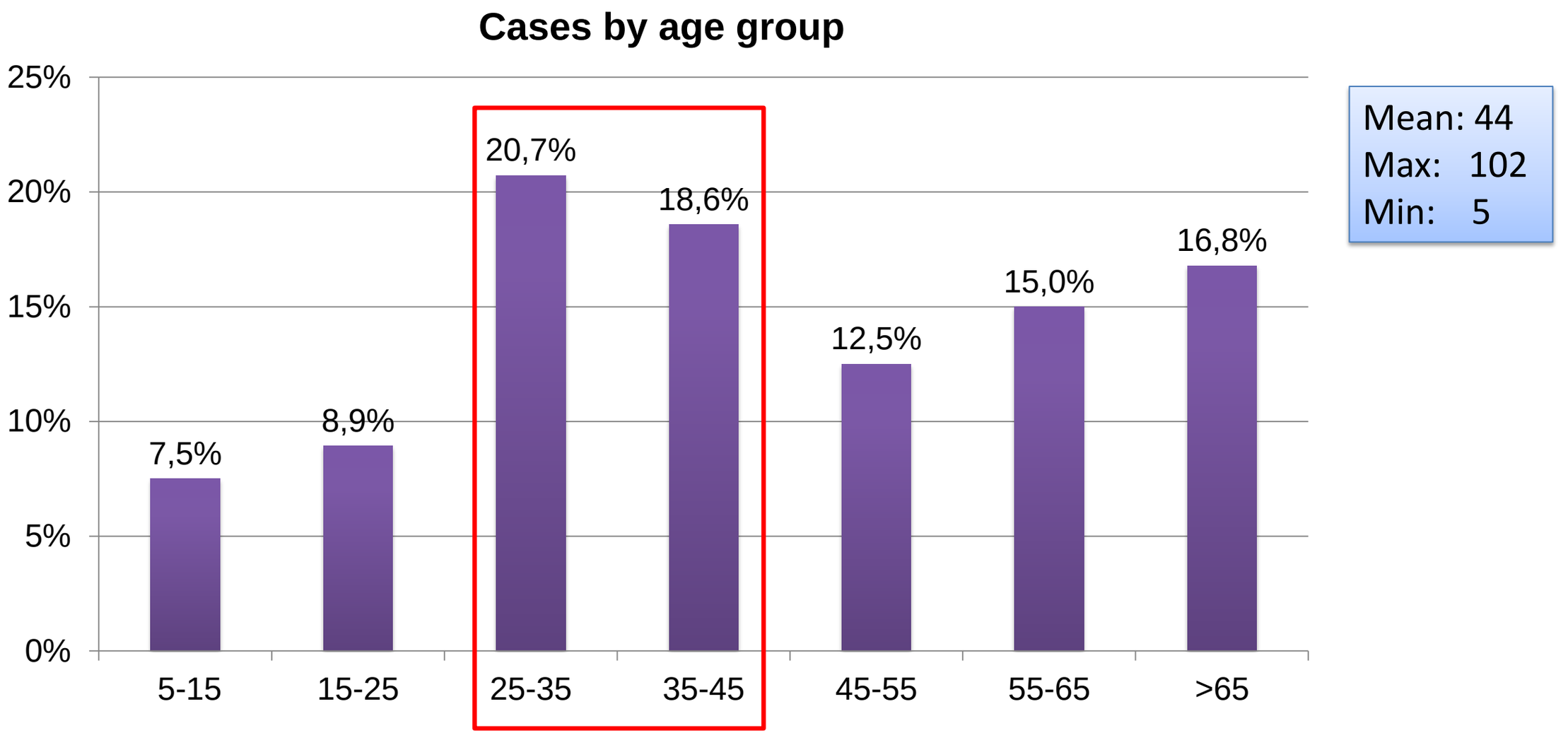

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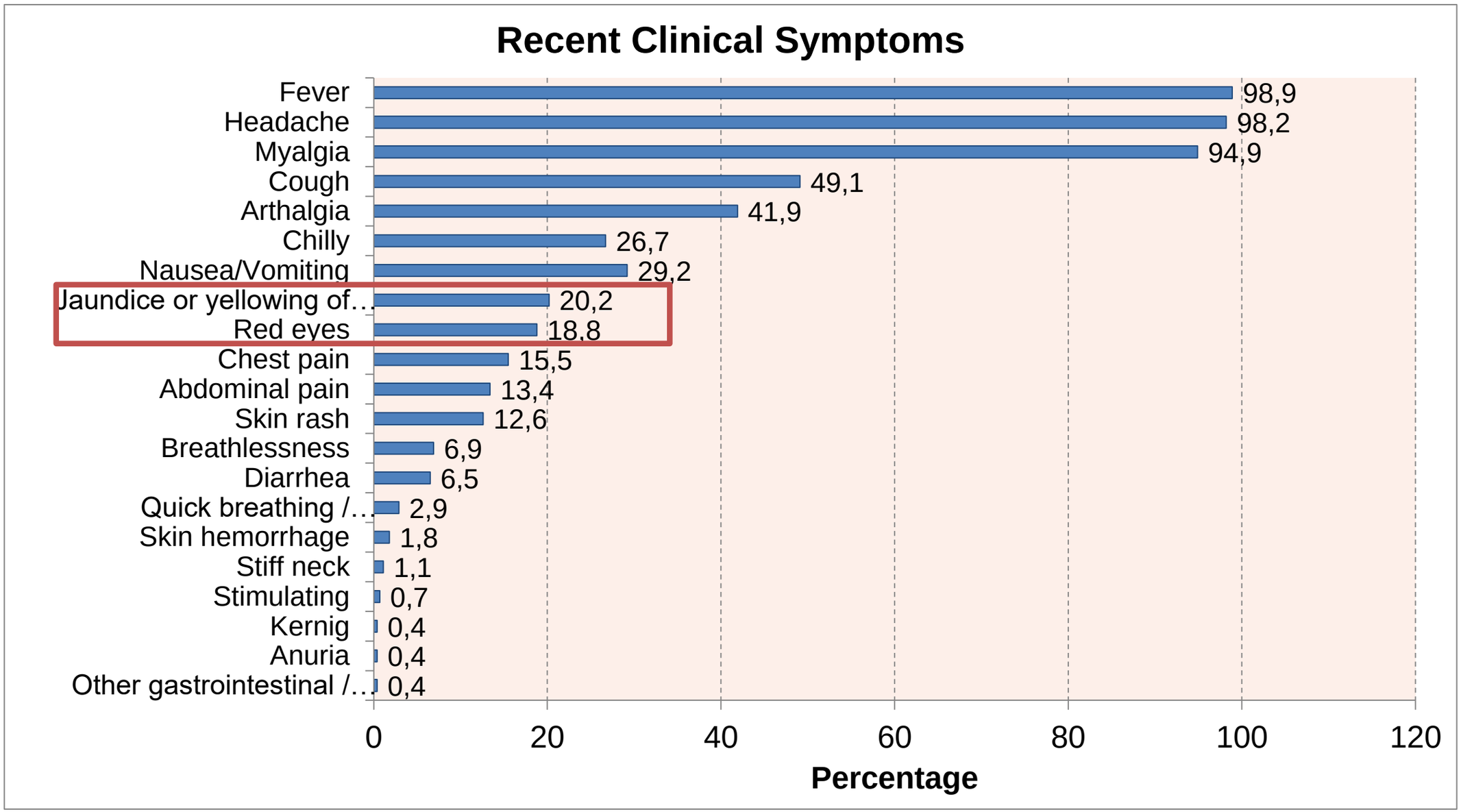


# #1. Hospital-based surveillance

## Modified Faine score _WHO

| Part A: Clinical Data | Score |
|---|---|
| Headache | 2 |
| Fever | 2 |
| If fever, temperature 39°C or more | 2 |
| Conjunctival suffusion (bilateral) | 4 |
| Meningism | 4 |
| Muscle pain (especially calf muscle) | 4 |
| Conjunctival suffusion+Meningism+Muscle pain | 10 |
| Jaundice | 1 |
| Albuminuria or nitrogen retention | 2 |
| **Part B: Epidemiological Factors** | **Score** |
| Rainfall | 5 |
| Contact with contaminated environment | 4 |
| Animal contact | 1 |
| **Part C: Bacteriological and Laboratory Findings** | |
| Isolation of *Leptospira* on culture | Diagnosis certain |
| Positive serology | |
| ELISA IgM positive*; SAT positive*; MAT single high titre* (Any one of the three tests should be scored) | 15 |
| MAT rising titre (paired sera) | 25 |

A presumptive diagnosis of leptospirosis may be made if: (i) Score of Part

Presumptive diagnosis of leptospirosis is made of:

Part A or Part A & Part B score : 26 or more

Part A, B, C (Total) : 25 or more

A score between 20 and 25 suggests leptospirosis as a possible diagnosis.

# #1. Hospital-based surveillance

## FAINE's Score Part A and B

| Faine's score A+B | Confirmed cases | Neg. cases |
|---|---|---|
| Mean | 15.3 | 14.5 |
| Min | 6 | 4 |
| Max | 24 | 25 |

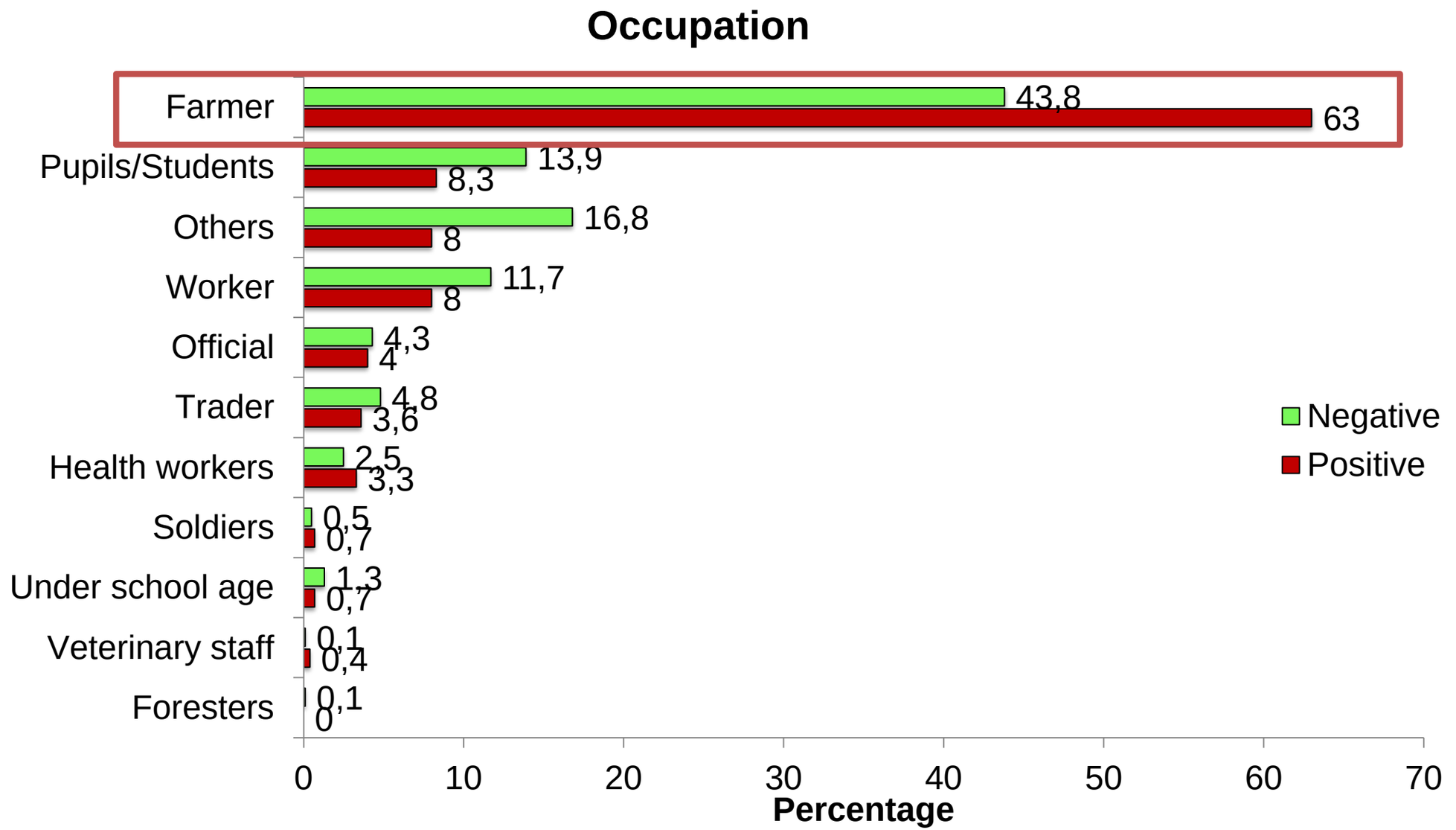
# #1. Hospital-based surveillance

## FAINE's Score with single ELISA test

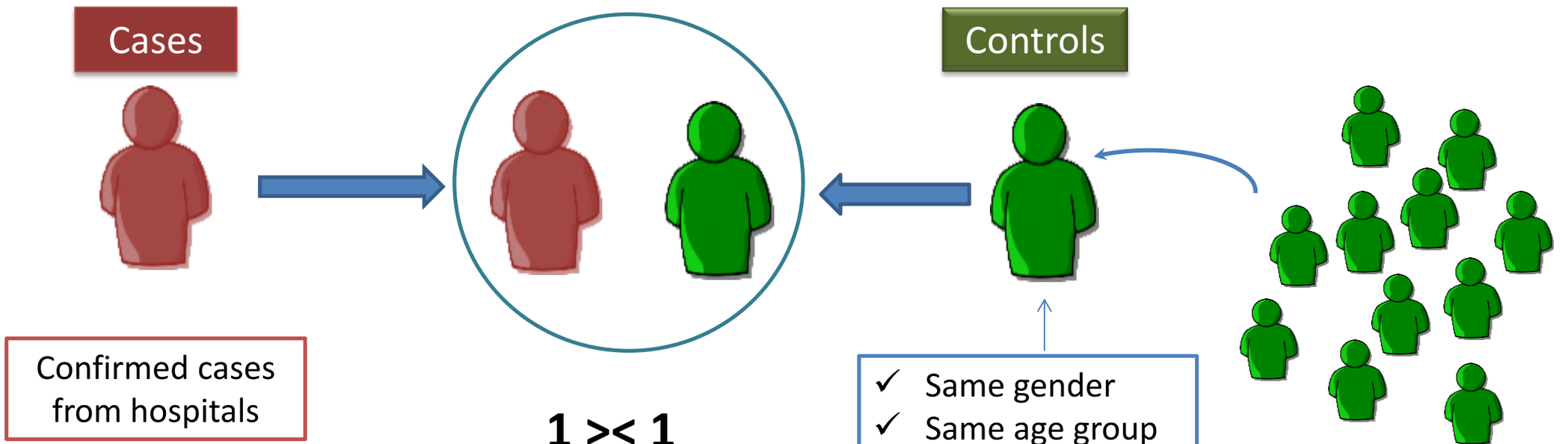
| | Confirmed cases | Neg. cases |
|---|---|---|
| Faine's score A+B+C≥25 | 210 | 551 |
| Faine's score A+B+C <25 | 67 | 2079 |

| | |
|---|---|
| **Sensitivity** | **75,8%** |
| **Specificity** | **79%** |
| **Positive Predict Value** | **27,6%** |
| **Negative Predict Value** | **96,9%** |

# #1. Hospital-based surveillance



# #2. Community-based case-control study

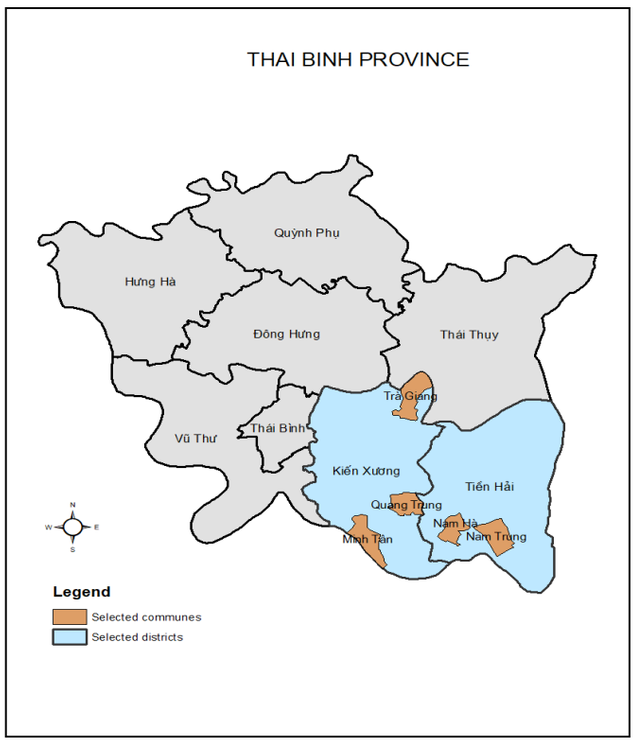


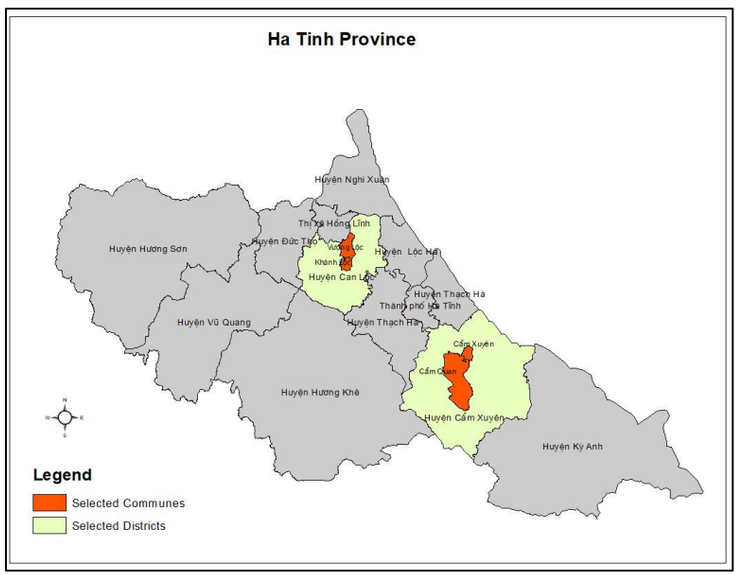
# #2. Community-based case-control study

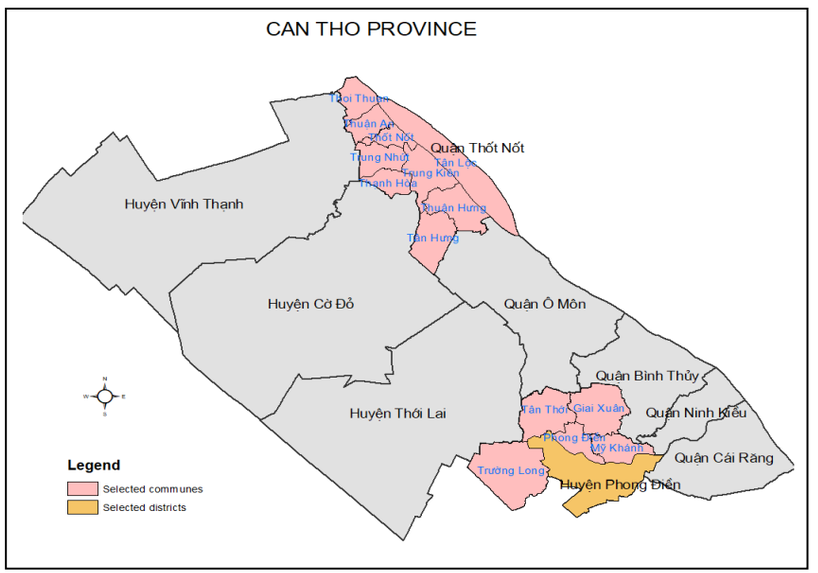
| Cases | Controls | Controls tested |
| --- | --- | --- |
| 280 | 90% | 15% |

# #3. Serology cross-sectional survey-Animal

## Animal sampling sites



# #3. Serology cross-sectional survey-Animal

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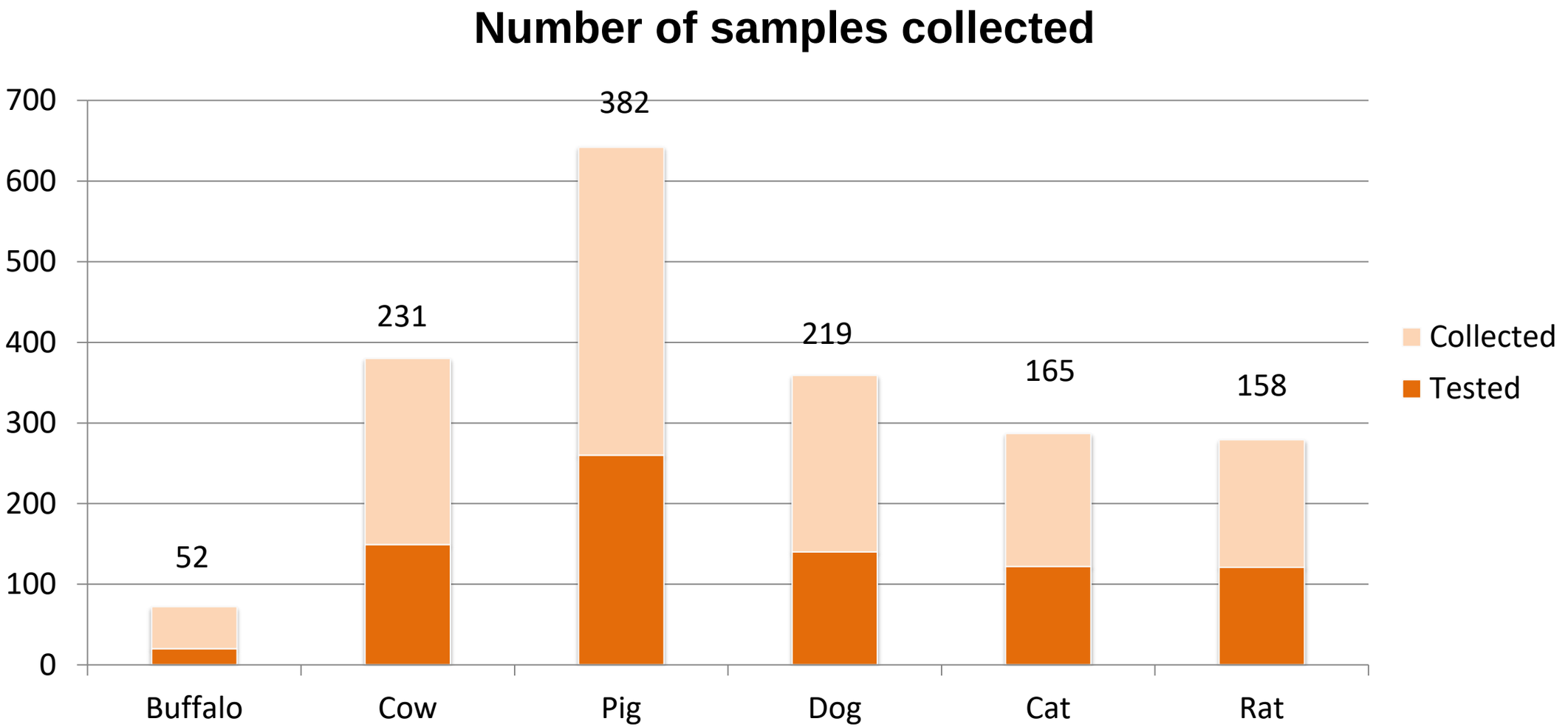
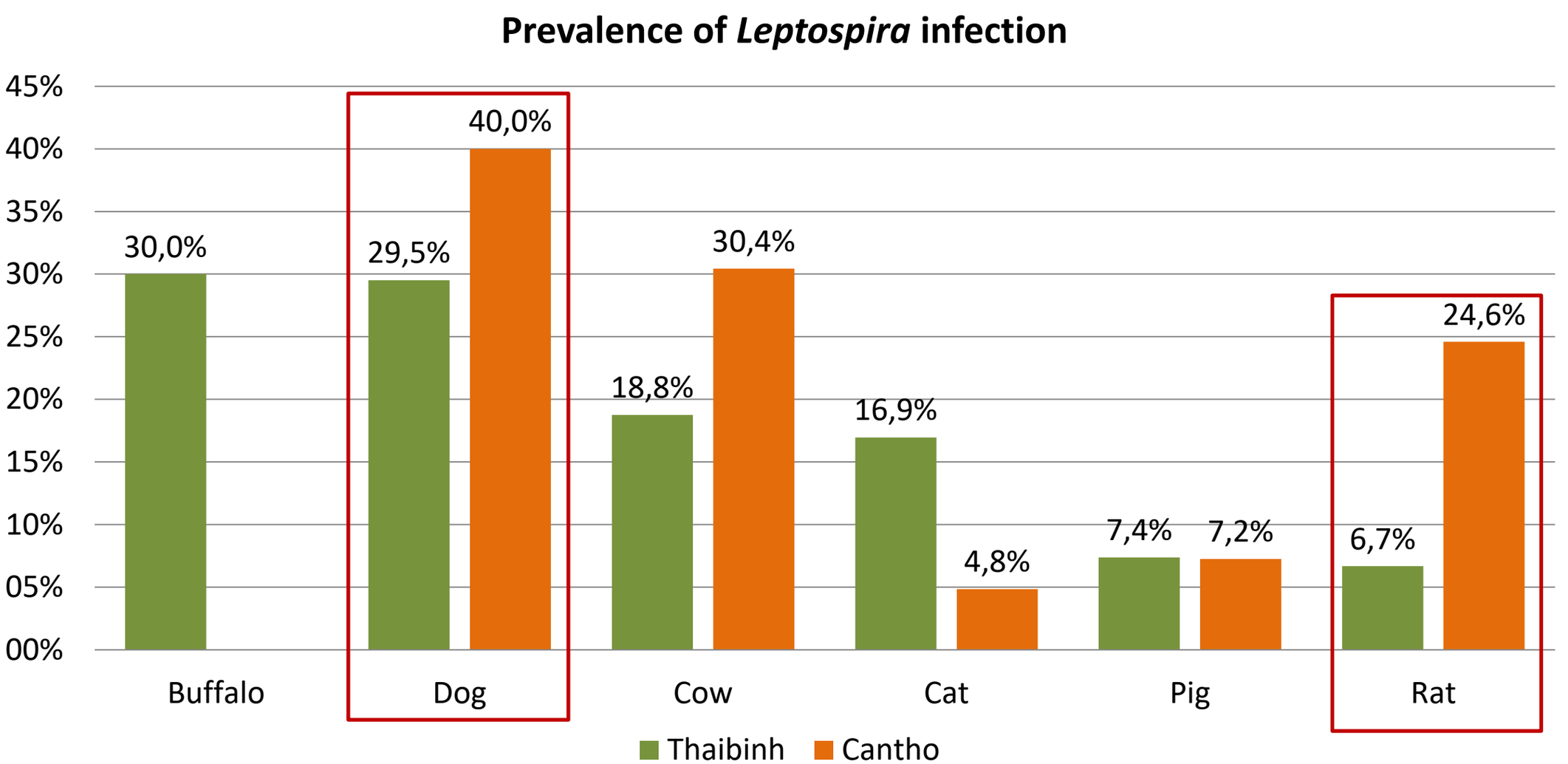


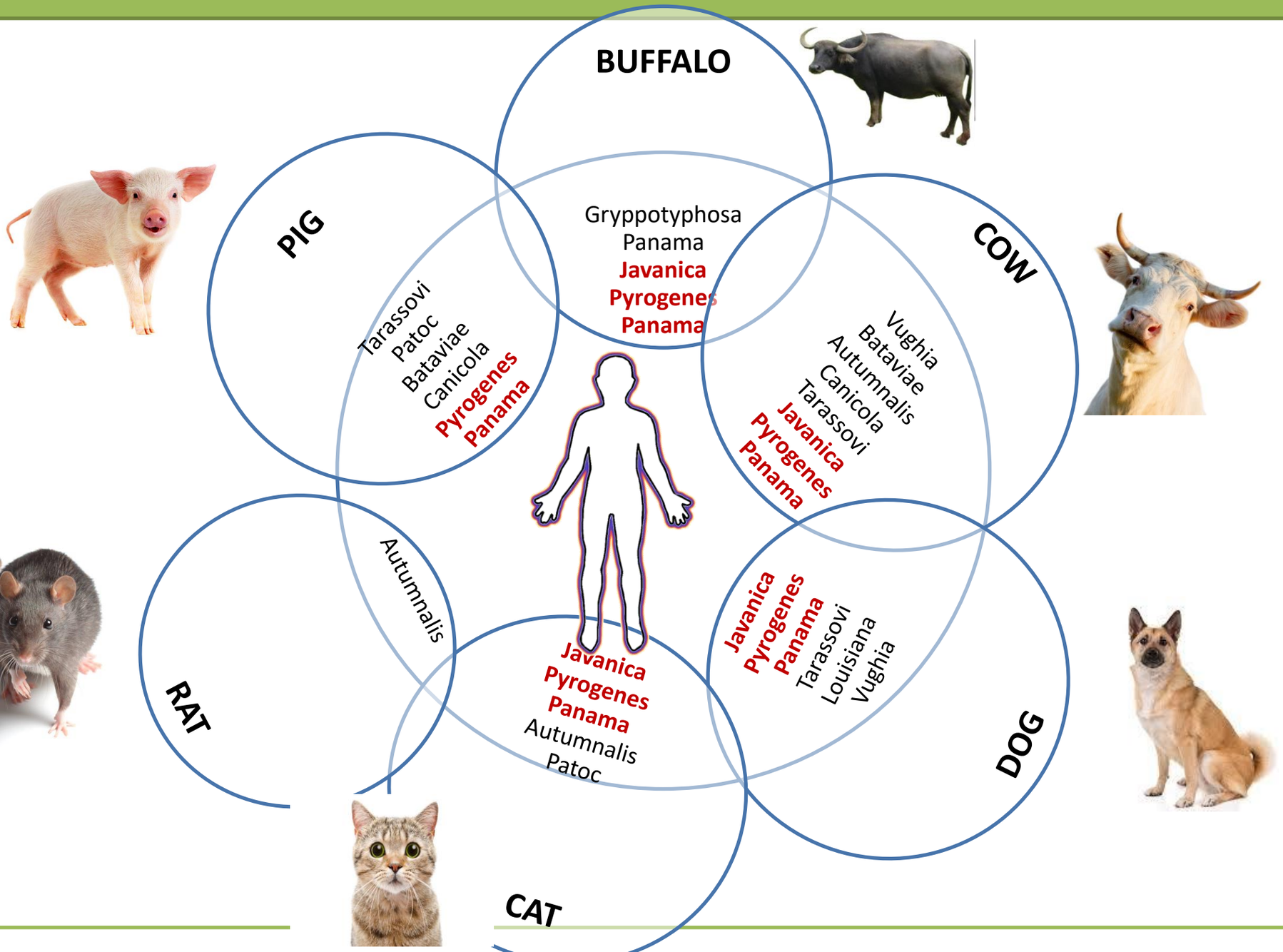
# #3. Serology cross-sectional survey - Animal



# #1;3. Detected serovars in animals and human

| HUMAN | COW | DOG | BUFFALO | PIG | CAT | RAT |
|---|---|---|---|---|---|---|
| Louisiana | Pyrogenes | Pyrogenes | Javanica | Ballum | Javanica | Autumnalis |
| Patoc | Javanica | Panama | Louisiana | Patoc | Pyrogenes | Australis |
| Javanica | Bataviae | Javanica | Pyrogenes | Bataviae | Panama | Hardjobovis |
| Panama | Panama | Gryppotyphosa | Autumnalis | Pyrogenes | Autumnalis | Sejroë |
| Pyrogenes | Autumnalis | Australis | Gryppotyphosa | Canicola | Ballum | Ballum |
| Bataviae | Australis | Tarassovi | Panama | Tarassovi | Patoc | |
| Autumnalis | Canicola | Hardjobovis | Patoc | Gryppotyphosa | | |
| Tarassovi | Tarassovi | Sejroë | Ballum | Panama | | |
| Canicola | Vughia | Ballum | Tarassovi | | | |
| Hebdomadis | Ballum | Louisiana | | | | |
| Icterohaemorrhagiae | Castellonis | Vughia | | | | |
| Vughia | | | | | | |

# #1;3. Concurrent serovars in animals and human

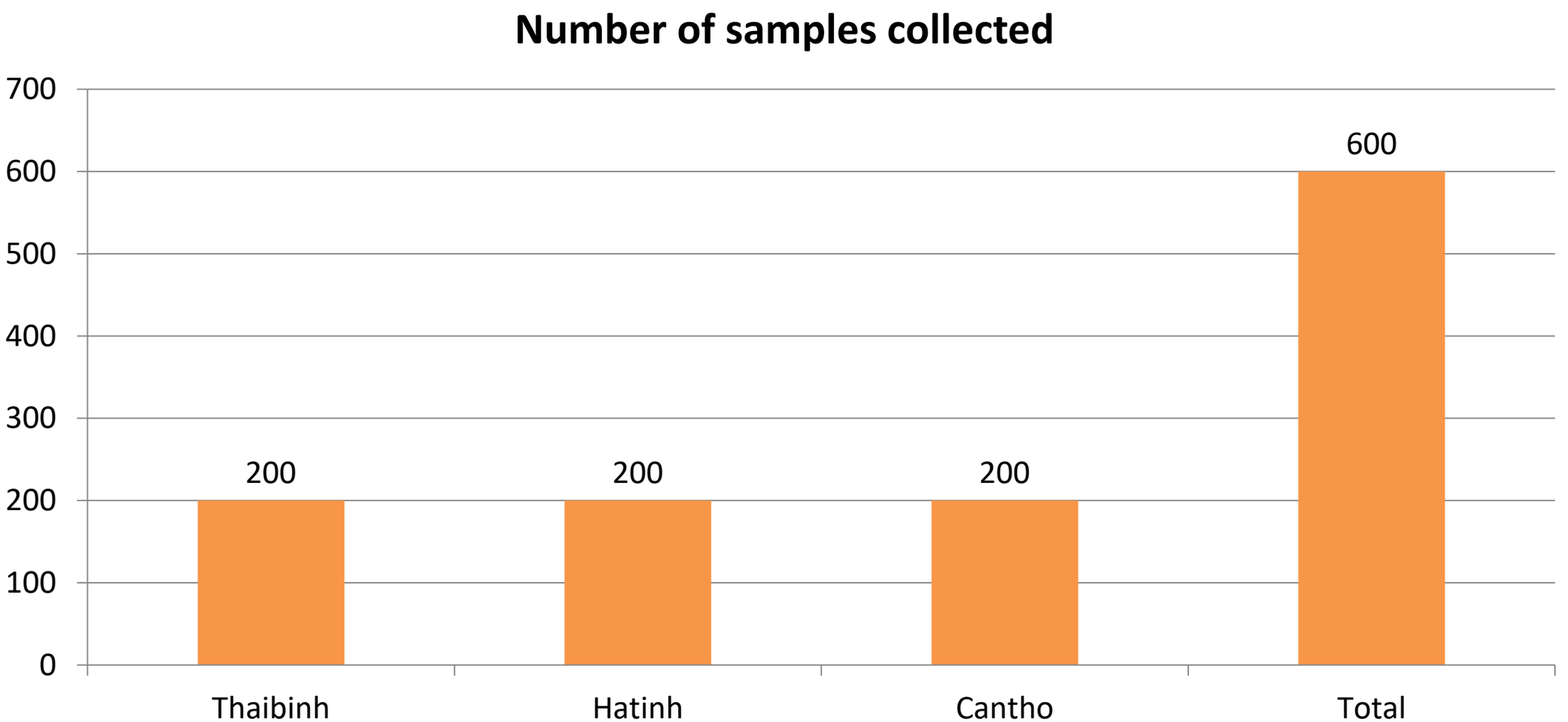


# #3. Serology cross-sectional survey - Human

- **Subjects:**
  - Household representative from 6 studied districts
  - Randomly sampling



# #3. Serology cross-sectional survey - Human

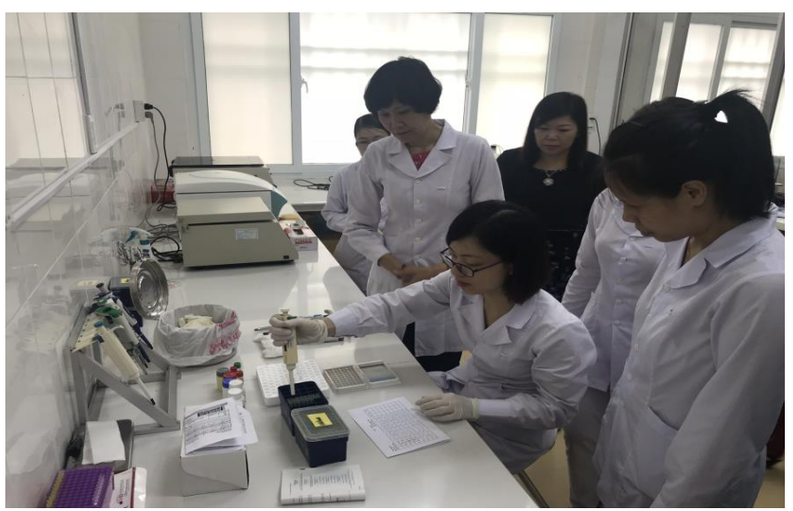


# #3. Serology cross-sectional survey - Human

# #4. Capacity building and knowledge translation

## 1. Learning by training

- Continuing training in **ELISA** at provincial labs
- Training in **qPCR** in IP New Caledonia



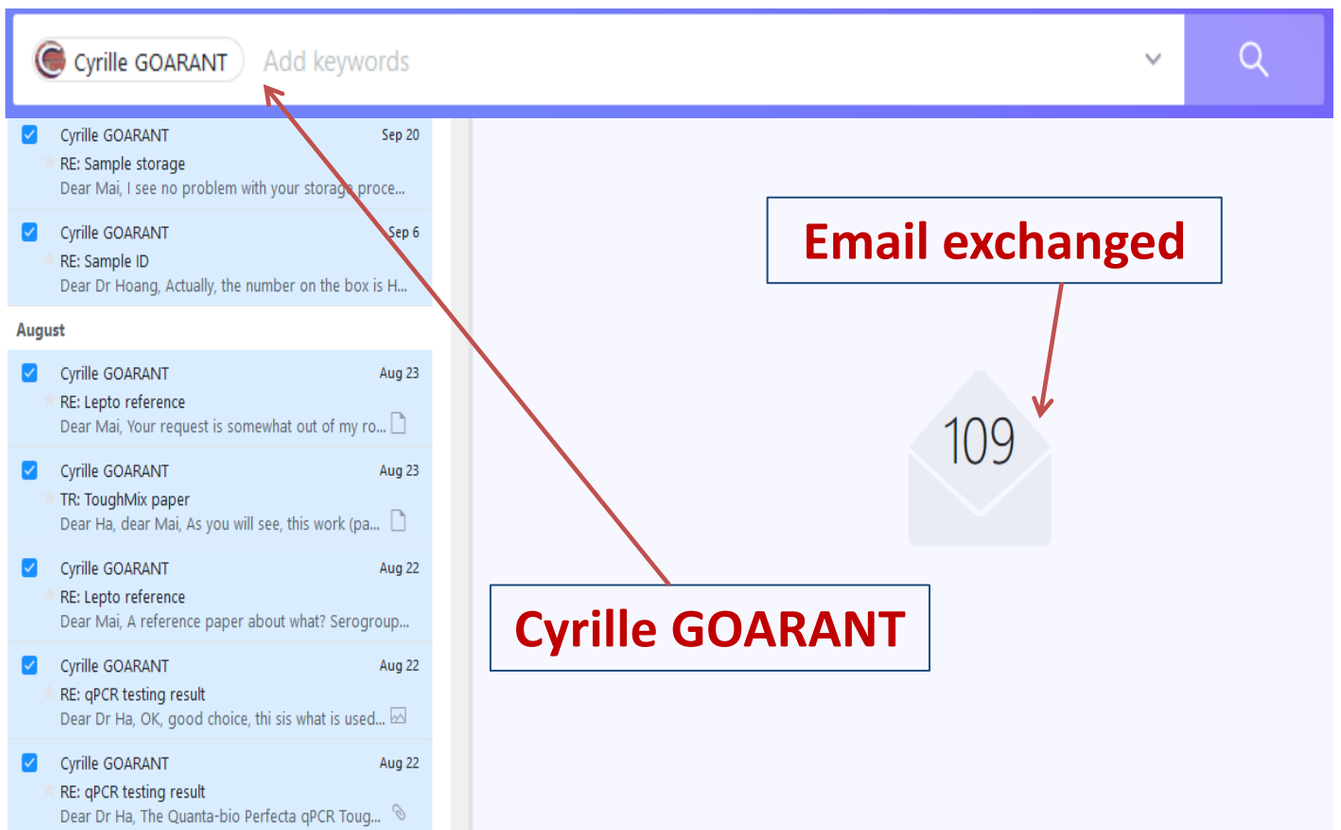
# #4. Capacity building and knowledge translation

## 2. Learning by doing

- **Health staffs:** Practice in ~ **5,500 samples** with ELISA at provincial labs
- **Veterinarians**: Technique of sample collection from animals

# #4. Capacity building and knowledge translation

## 3. Learning by knowledge exchanging and consultation



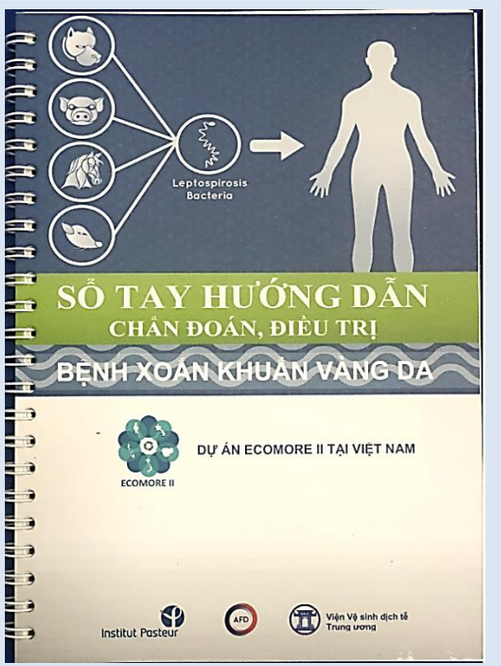


# #4. Capacity building and knowledge translation

Mid-term review meetings in 3 provinces




Booklet for *Leptospira* management



# #5. Collaboration improvement

- Meetings with animal sector from central to district levels
- Meeting with climate sector

# #5. Collaboration improvement

**NIHE**

**Strains exchanged**

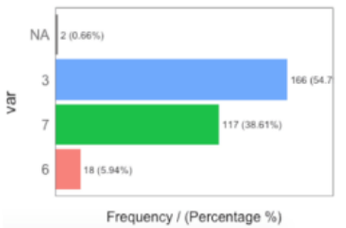
**NCVD**

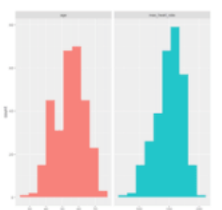
| | | |
|---|---|---|
| CYNOPTERI | cynopteri | 3522 C |
| ICTEROHAEMORRHAGIAE | copenhageni | Wijnberg |
| BALLUM | castellonis | Castellon 3 |
| TARASSOVI | vughia | LT 89-68 |
| LOUISIANA | louisiana | LSU 1945 |
| sejroë | hardjobovis | Sponselee |
| sejroë | Wolffi | 3705 |
| CELLEDONI | Celledoni | Celledoni |
| DJASIMAN | Djasiman | Djasiman |
| MINI | Mini | Sari |
| SHERMANI | Shermani | 1342K |

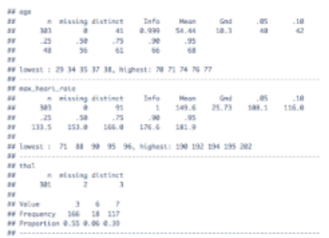
| | | |
|---|---|---|
| SEJROE | Hardjo | Hardjoprajitno |
| SEJROE | saxkoebing | Mus 24 |
| SEJROE | Hardjo | Hardjo Bovis |
| BLATISLAVA | | |

# WHAT NEXT?

- **PROJECT WRAP-UP**
  - Complete testing samples
  - Data entry
  - Data analysis

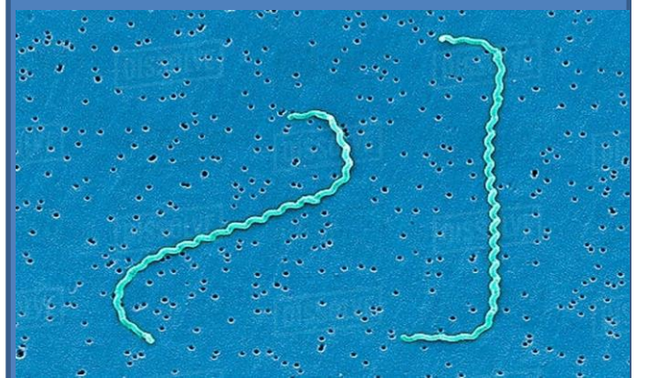




# WHAT NEXT?

- **PUBLICATIONS**
  - Science articles
  - Reference book



*LEPTOSPIRA*: EPIDEMIOLOGY, CLINICAL MANIFESTATION, AND DIAGNOSIS

# WHAT NEXT?

- **LOOKING FOR FURTHER COLLABORATION**

  To answer the question “Which pathogens out of *Leptospira*”?


# Thank You