# Biosecurity measures and Swine Influenza: a review

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Copenhagen, March 2025

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cost EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

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FACULTAS MEDICINAE VETERINARIAE SKOPJE

# Working Group 3

> Foster knowledge exchange on surveillance and management measures to improve control of swIAV in pig herds

## Aim

- To review and discuss current surveillance schemes and diagnostic sampling frames.
- To conduct a cost benefit analysis of improved surveillance and a risk assessment of emerging influenza variants
- To suggest optimized sampling frames for surveillance and exchange tools for analysis of data from field trials
- To establish a platform for sharing of evidence-based data on SwIAV with policy- makers, public institutions and authorities

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# 1. Introduction

- **Rationale:** While numerous studies have addressed **biosecurity measures**, few have specifically linked them to the control of **swine influenza**, a pandemic infectious disease with zoonotic potential. Gathering and analysing biosecurity data is crucial for identifying **knowledge gaps**, which can ultimately **aid in the management, optimization, and control** of swine influenza in pig herds.
- **Objectives:** obtain information about the biosecurity measures related to swine influenza and other respiratory diseases.

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# 2. Methods

## 2.1 Research questions

- Which biosecurity measures regarding swine respiratory diseases are currently studied in the literature?
- Which are the most relevant topics and in what depth are they assessed?

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# 2. Methods

## 2.2 Information sources

- American Association of Swine Veterinarians (AASV) repository (1999-2021)

  "Swine" OR "Pig" AND "swine influenza" OR "swIAV" OR "respiratory diseases"

- Database from BETTER COST action including published search (1995-2022)

  Based on farm biosecurity assessment impact of biosecurity → swine/pig labelled

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# 2. Methods

## 2.3 Eligibility criteria

- Studied measures not specific for respiratory swine diseases.
- Focused on other animal species than swine.
- Purely experimental studies with no application on field.

- Biosecurity measures or assessment of biosecurity measures related to respiratory diseases in swine.
- Evaluation of the impact of biosecurity implementation on swine farms.
- Abstract available in English.
- Case reports and proceedings OR Published papers.

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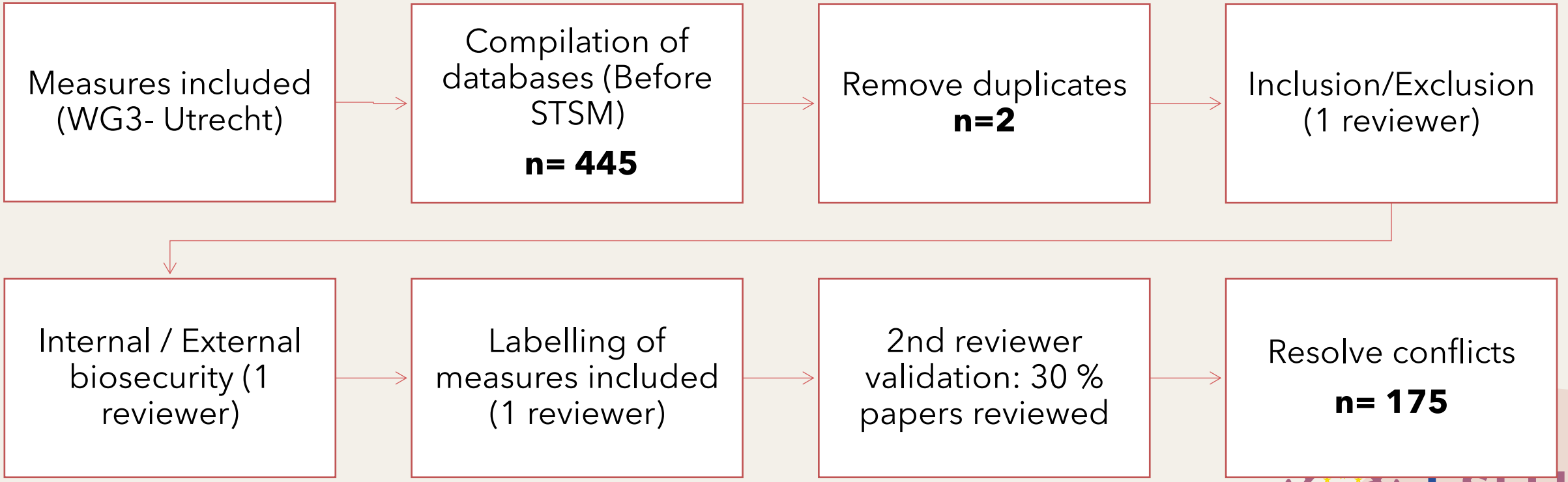
# 2. Methods

## 2.4 Selection process

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| Purchase / Introduction of breeding pigs and piglets | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Health status (swIAV + general) | Quarantine | Origin herds | Minimize contact | Frequency of purchase | Age of the animals | Vaccination status | Disinfection – protocols at quarantine | All in – all out | Management of the quarantine | Acclimation/Adaptation | Closing the herd | Hygiene quarantine | Workflow at the quarantine | Other |

| Transport of animals, removal of carcasses and manure | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Entering trucks at the farms | Cleaning/disinfection of transport vehicle | Protocol/SOP of the driver | Mixing origins of animals / contact of the driver during transport / in the truck | Collection/location and transport of carcases: frequency and storage / location of storage | Loading unloading protocols / SOP | Manure equipment / technology /protocols | Storage of carcasses / manure | Freq of carcass removal | Off-site location facility for incoming feeds | **Loading area for pigs** |

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| Fences gates farm entrance | | | | | | | |
|---|---|---|---|---|---|---|---|
| Closed fence around | Pets/wild boars/ people | Controlling / Registration/ entrance | Entrance of the farm | hygiene sluice | entrance information / rules (SOP) | parking vehicles | Other |

| Visitors and farm workers | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No pigs at home | No animal contact | Minimum number of visitors | Training of workers on biosecurity / hygiene/ disinfection | Protecting clothing including mask | Visitors room | No clinical respiratory symptoms / vaccination status | Equipment / material disinfection = only needed material! Vet material | SOP cleaning/di sinfection rules | Workers smoking | Visitor´s registration |

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| Vermin, bird/pets and fly control | | | | | | | |
|---|---|---|---|---|---|---|---|
| Animals not entering the barn | Vermin control by professional company | Netting and gritting | Manure management | Bush / grass / trees | Cleaning / disinfection outdoor | Feed and bedding and enrichment material | Other |

| Location of the farm | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Wind direction | Distance from other farms / animals | Type of farms / # farms | Landscape (hills, trees, forest) | Distance from the main road | Other facilities around the farm | Presence wild animals / boars | Other | **Density of pig farms around** |

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| Strict hygiene and hygiene measurements | | | | | | |
|---|---|---|---|---|---|---|
| Equipment (Separate, Clean, Ease identified per compartment) | Internal restricted movement for workers&visitors (one person/category) | Desinfeciton bath | Cloths & shoes (separate, colour/marked, clean) | Gloves and washing hands | Showers for the workers/visitors | Others |

| Animal flow | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| All in-all out system | Age separation by room/compartment | No mixing of groups | Carcass handling & location | Limited cross fostering | Internal farm desing | Frequency of moving of animals | Frequency & Method of Introduction of gilts in the herd | Hospital pen (compartments) | Reintroduction of recovered animals | Animal density | Other |

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| Quality interior and hygiene | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Feeding & Water system hygiene | Separation of pits and compartments | The quality of floor – material of the floor | Easy cleaning structures | Building materials | Pen separation | Bedding system | Feeding system installation (shared feeding and drinking) | The quality of farrowing compartment (piglet nest) | Other |

| Internal farm climate and ventilation | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Type of ventilation system | Operation of the ventilation system | Maintanence of the ventilation system | Air filtering | Separated compartment ventilation | CO2, NH3, H2S, Dust particles | Temperature and air humidity (stability of T and RH) | Air flow and draft | Other |

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| Health monitoring and vaccination program | | | | | | |
|---|---|---|---|---|---|---|
| Monitoring system of the disease/pathogen (sampling, necropsy) | Record keeping | Type of vaccine (commercial or autogenous vaccines) | Timing of vaccination piglets/sows | Monitoring of production | Monitoring clinical signs (i.e, respiratory symptoms, Abortion and mortality rate) | Other |

| Cleaning and disinfection | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Floor and bedding hygiene | Selection of disinfectant and concentration | Correct use of cleaners and disinfectants | Trainings of the workers | Testing the disinfection | Frequency of cleaning and disinfection | Appropriate drying and warming periods | Appropriate resting period of the building | Proper and deep cleaning | Cleaning and disinfection of all materials and building (everything) | Other |

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# 3. Results

## Excluded studies:

- Purely experimental (n=33)
- Vaccine adjuvant experiments (n=10)
- None-respiratory diseases or AMU
- General biosecurity (n=55)
- Economy of the disease (n=10)
- Epidemiology, surveillance (n=16)

Antimicrobial use (n=25)
*Salmonella* (n=13)
ASF (n=31)
Gastrointestinal virus (n=19)
Other diseases (n=34)

- CSV
- *Toxoplasma*
- PEDv
- *B. suis*
- FMD
- *E. coli*
- Aujesky
- *Yersinia enterocolitica*

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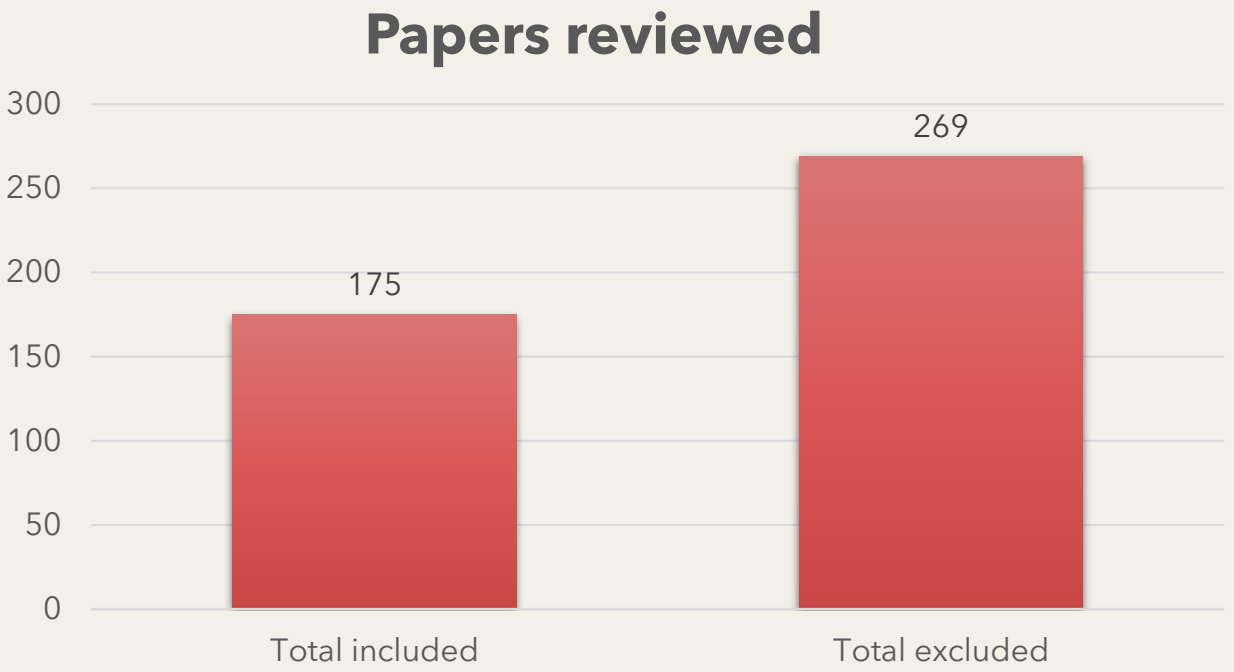
# 3. Results

## Included studies

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# 3. Results

**Level of agreement** (ongoing process) **1st Stage**

- Exclude papers: 100%
- Include papers: 75%
- Measures labelling: 87%
- Further analysis (measures):? (ongoing)

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# 3. Results

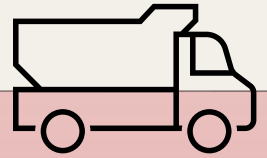
| Most cited topics | Less cited topics |
| --- | --- |
| 1. **Health monitoring and vaccination program** (n=244 citations) | 1. Cleaning and disinfection (n=20 citations) |
| 2. **Transport of animals, removal of carcasses and manure** (n= 106 citations) | 2. Quality interior and hygiene (n= 23 citations) |
| 3. **Animal flow** (n=92 citations) | 3. Internal farm climate and ventilation (n=28 citations) |

# 3. Results: most cited measures

Type of vaccine (n=95)

Timing of vaccination (n=78)

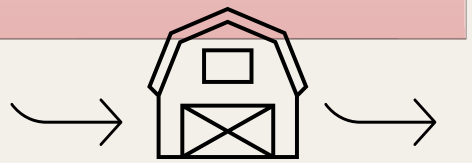
Monitoring of the disease (n=30)



Entering trucks at the farm (n=26)

Storage of carcasses/manure (n=21)

All in- all out System (n=21)



Distance from other farms (n=20)

Protective clothing including mask (n=19)

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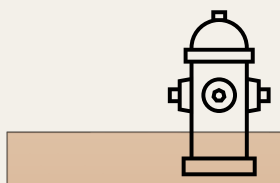
# 3. Results: non-cited measures



Hygiene sluice

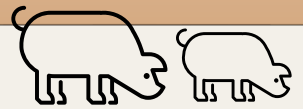
Parking vehicles

Bush / grass / trees

Cleaning / disinfection outdoor

Disinfection – protocols at quarantine

Age of the animals



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# 3. Results: cited x1

| | | | | |
|---|---|---|---|---|
| Reintroduction of recovered animals | Building materials | Minimize contact | Closing the herd | Hygiene quarantine |
| Bedding System | Separated compartiment ventilation | Workflow at the quarantine | Workers smoking | Feed and bedding and enrichment material (bird control) |
| Trainings of the workers | Cleaning and disinfection of all materials and building (everything) | | Wind direction | |

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# 4. Discussion

- Vaccination (experimental)
- Record keeping
- Monitoring the disease
- “Maybe’s”

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# 5. Take-home messages

Health monitoring and vaccination programs, transport of animals, removal of carcasses and manure and animal flow were the most studied topics.

No studies about hygiene sluice, parking vehicles, bushes, cleaning and disinfection outdoor, disinfection protocols at quarantine, age of the animals.

There is not enough literature specifically focused on swIAV and biosecurity measures (n=88)

Next step: go deeper in the literature and (to be continued) comparing literature results with Experts consensus to find research gaps.

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# Acknowledgments

Dr. Isabelle Hennig-Pauka
Han Smits

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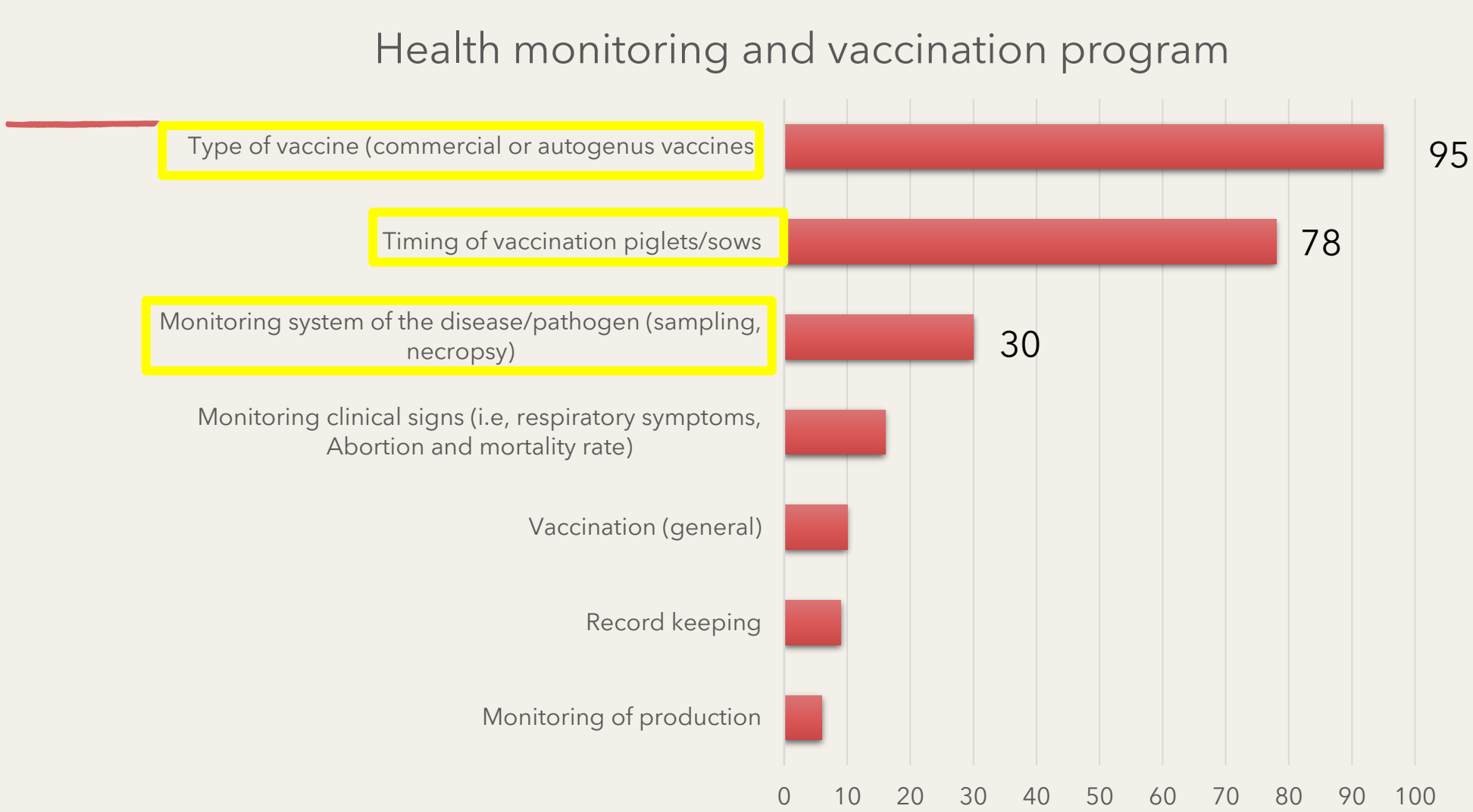
Source: fanpop.com

# THANKS FOR YOUR ATTENTION

# Extra slides

Results: number of papers citing each measure

# 3. Results

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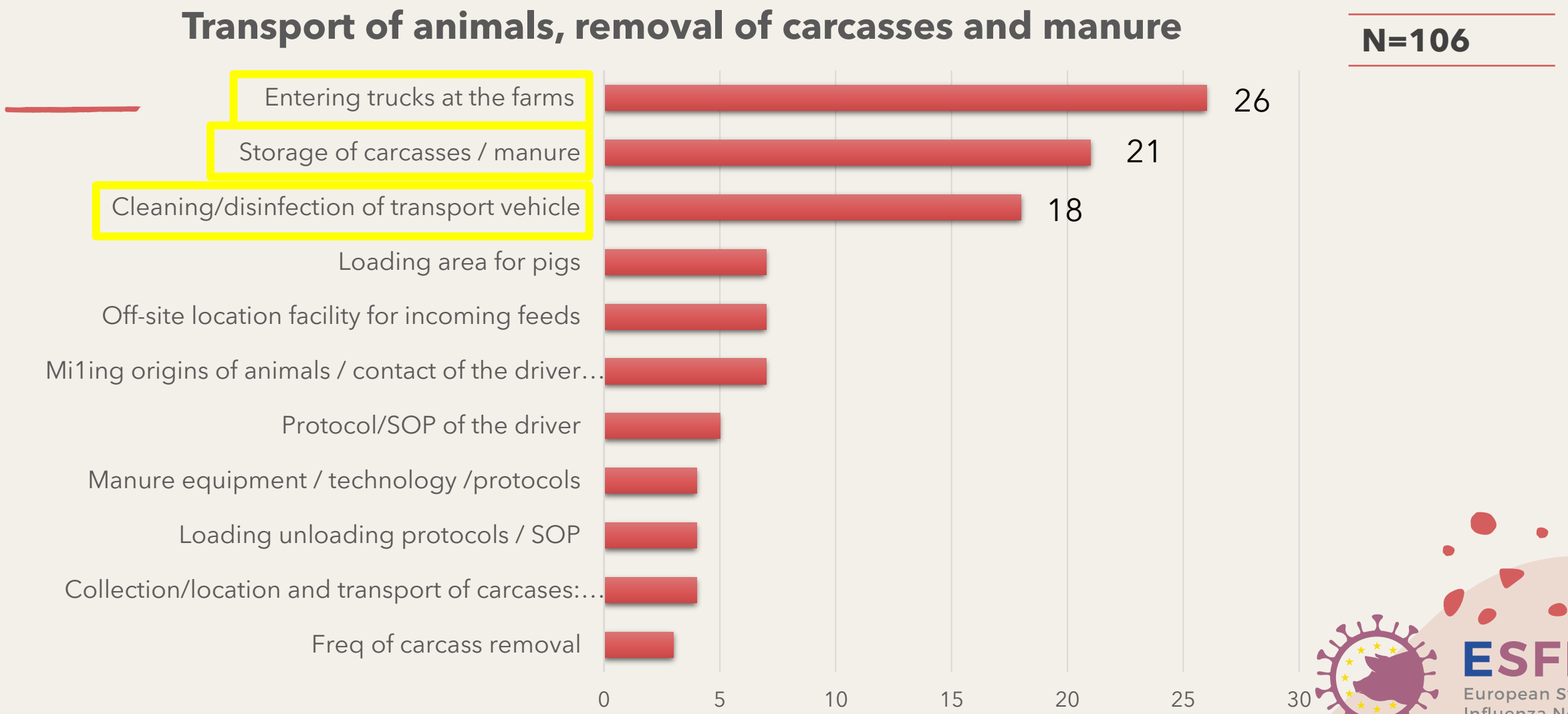
# 3. Results

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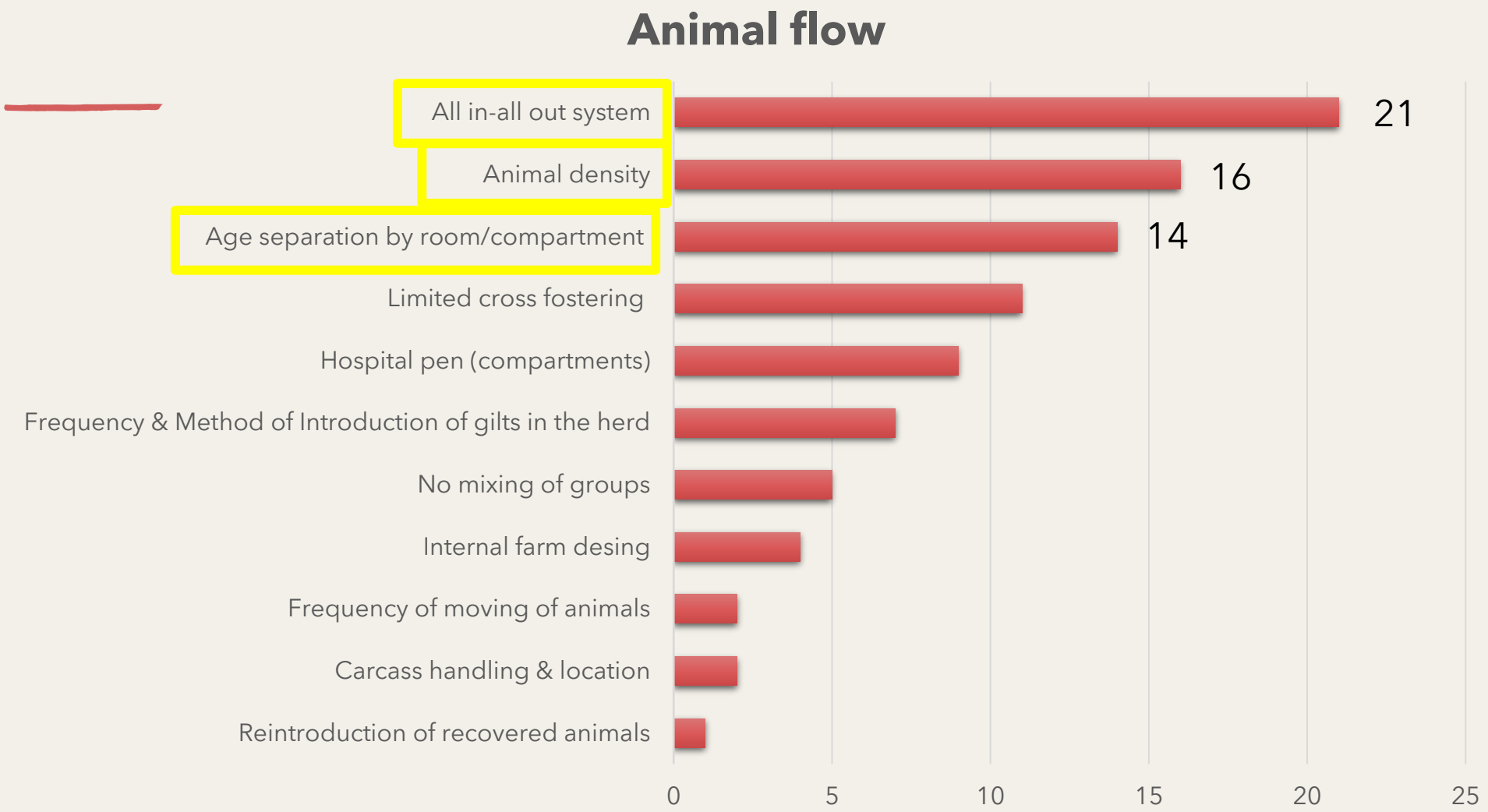
# 3. Results

N=92

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# 3. Results


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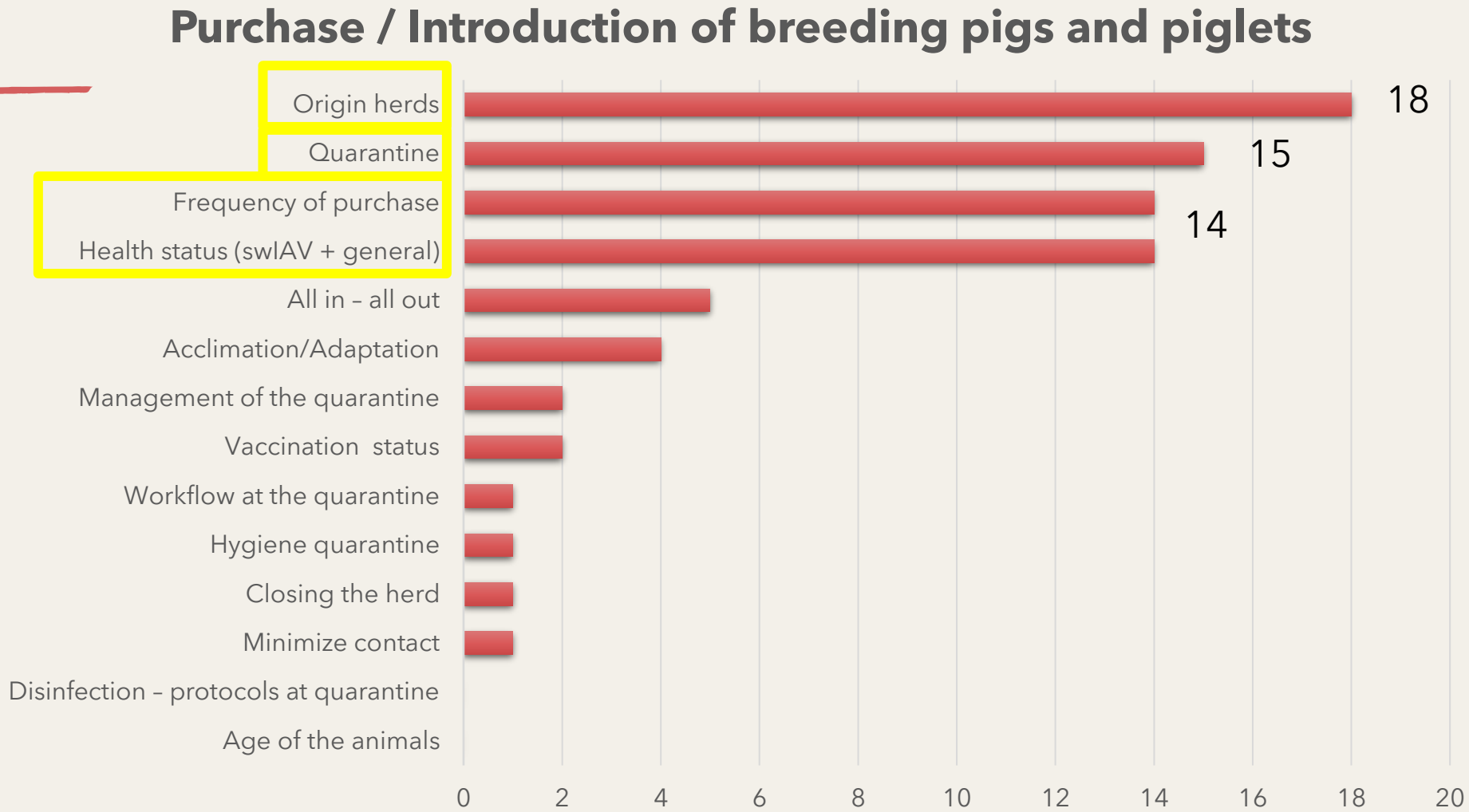
# 3. Results

N=78

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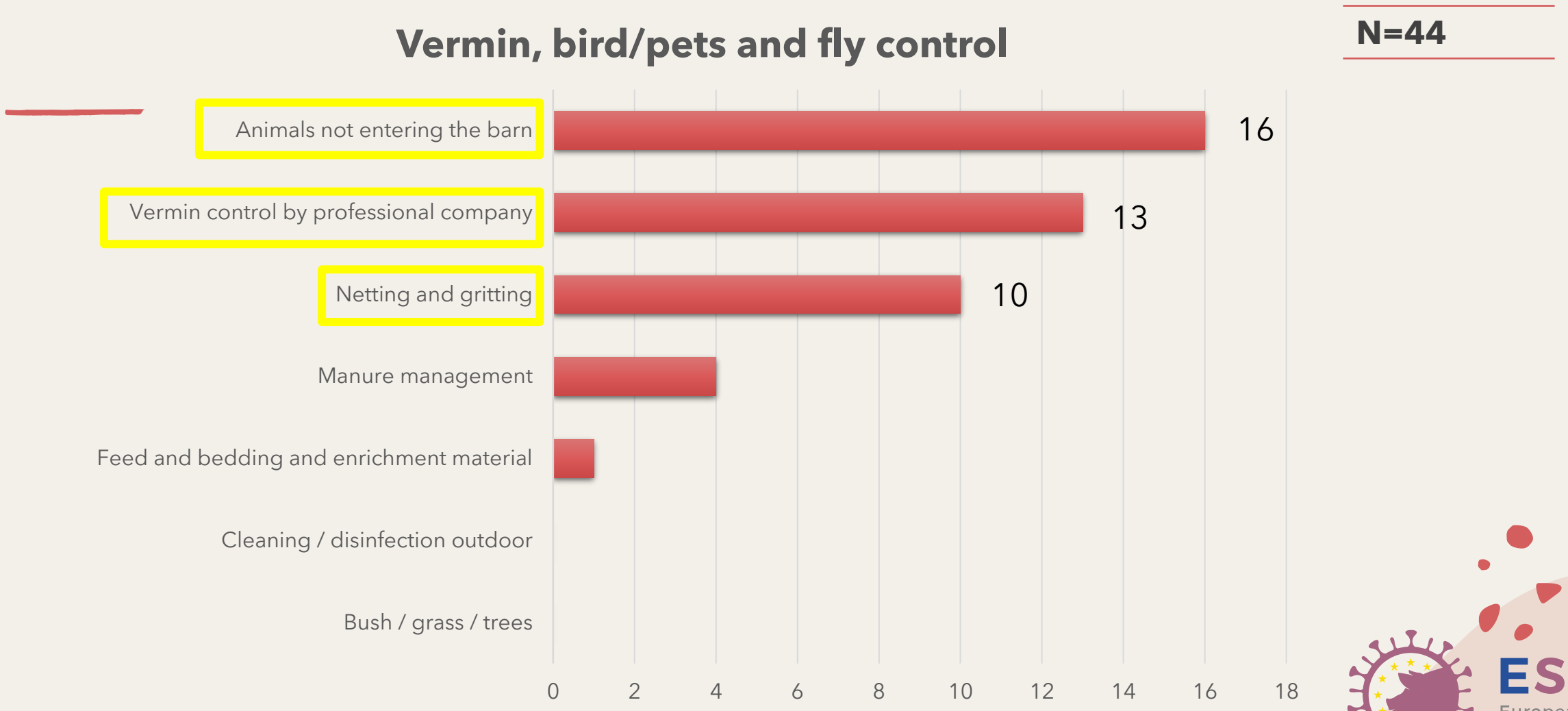


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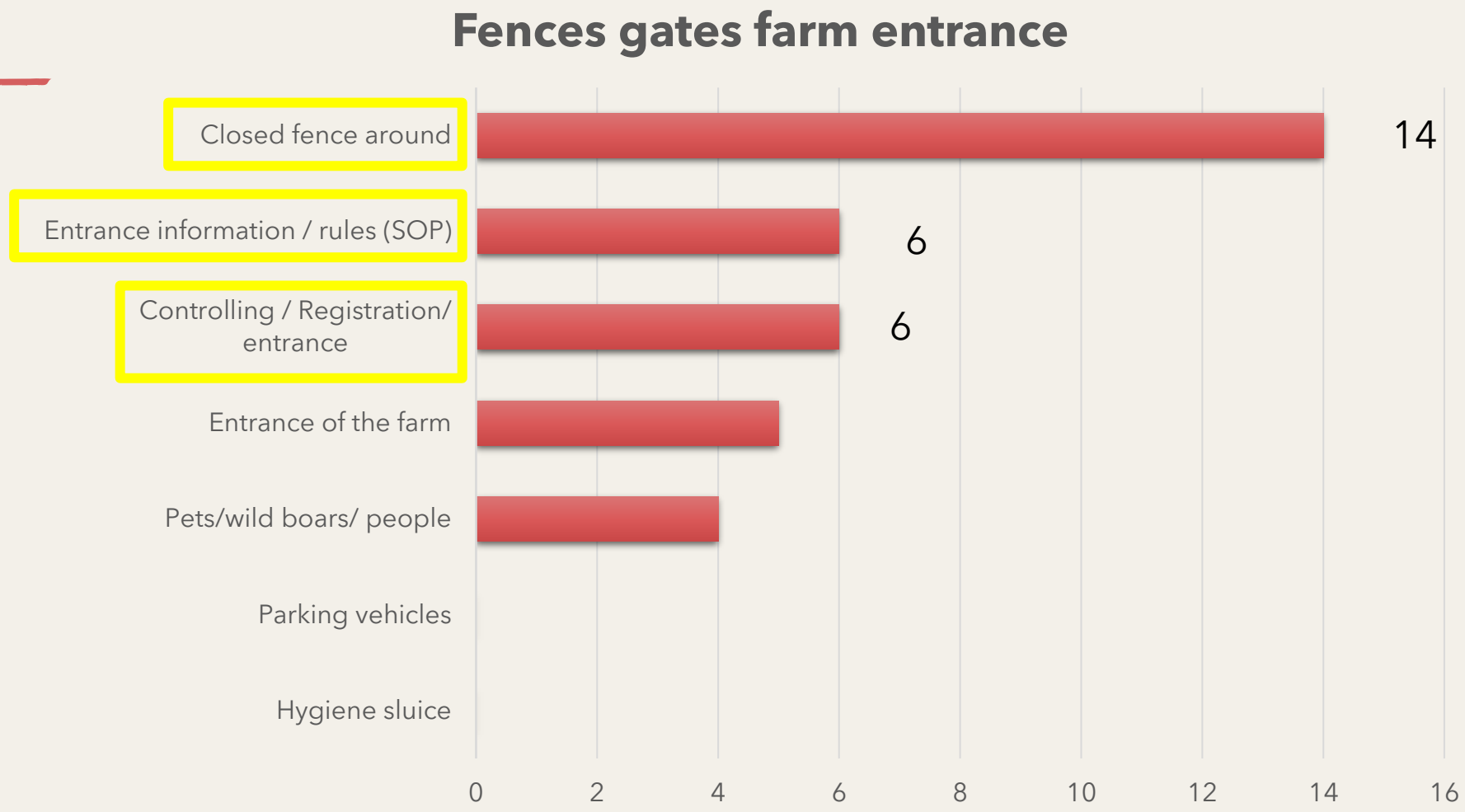
# 3. Results

N=35

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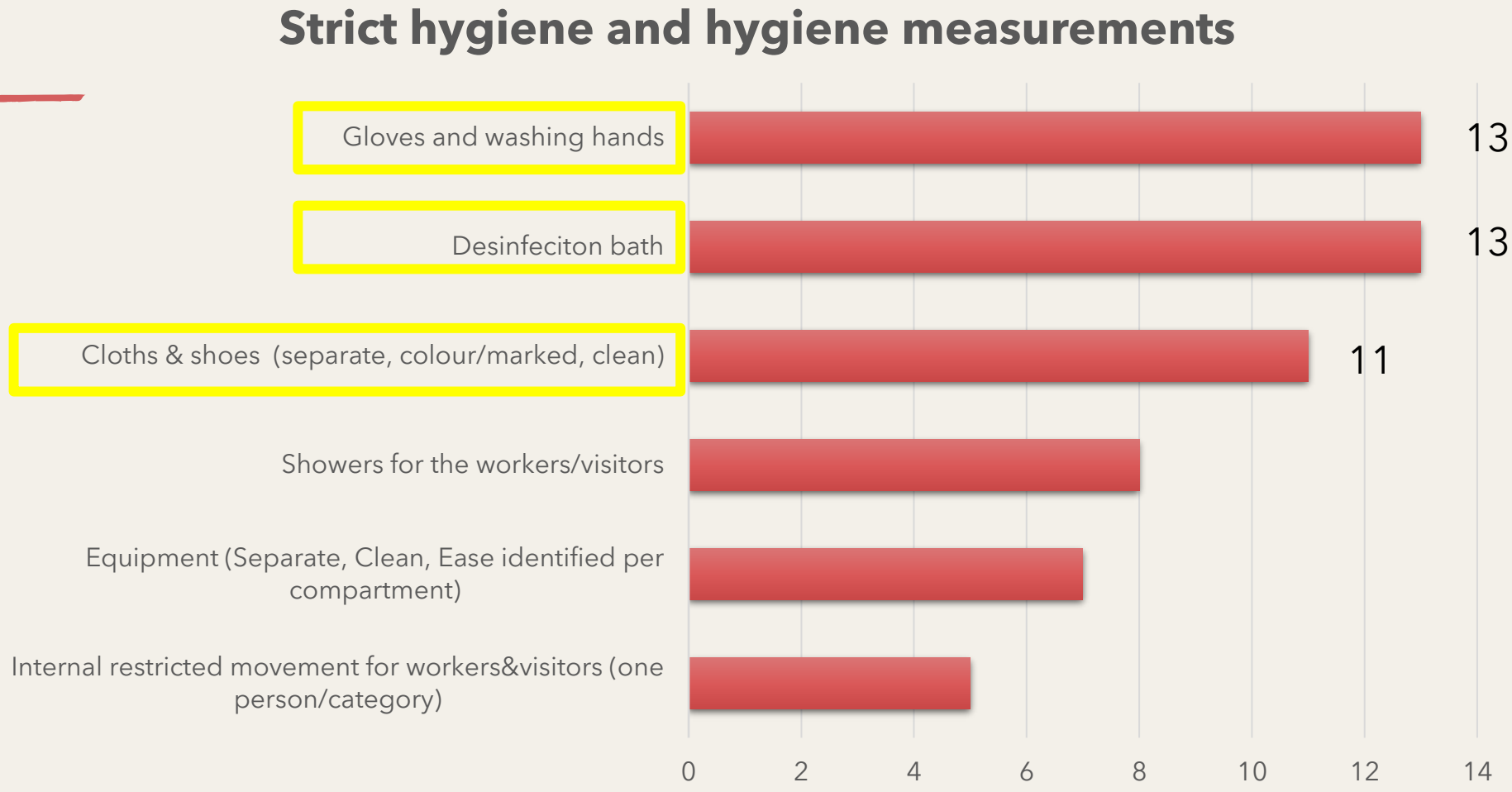
# 3. Results

N=57

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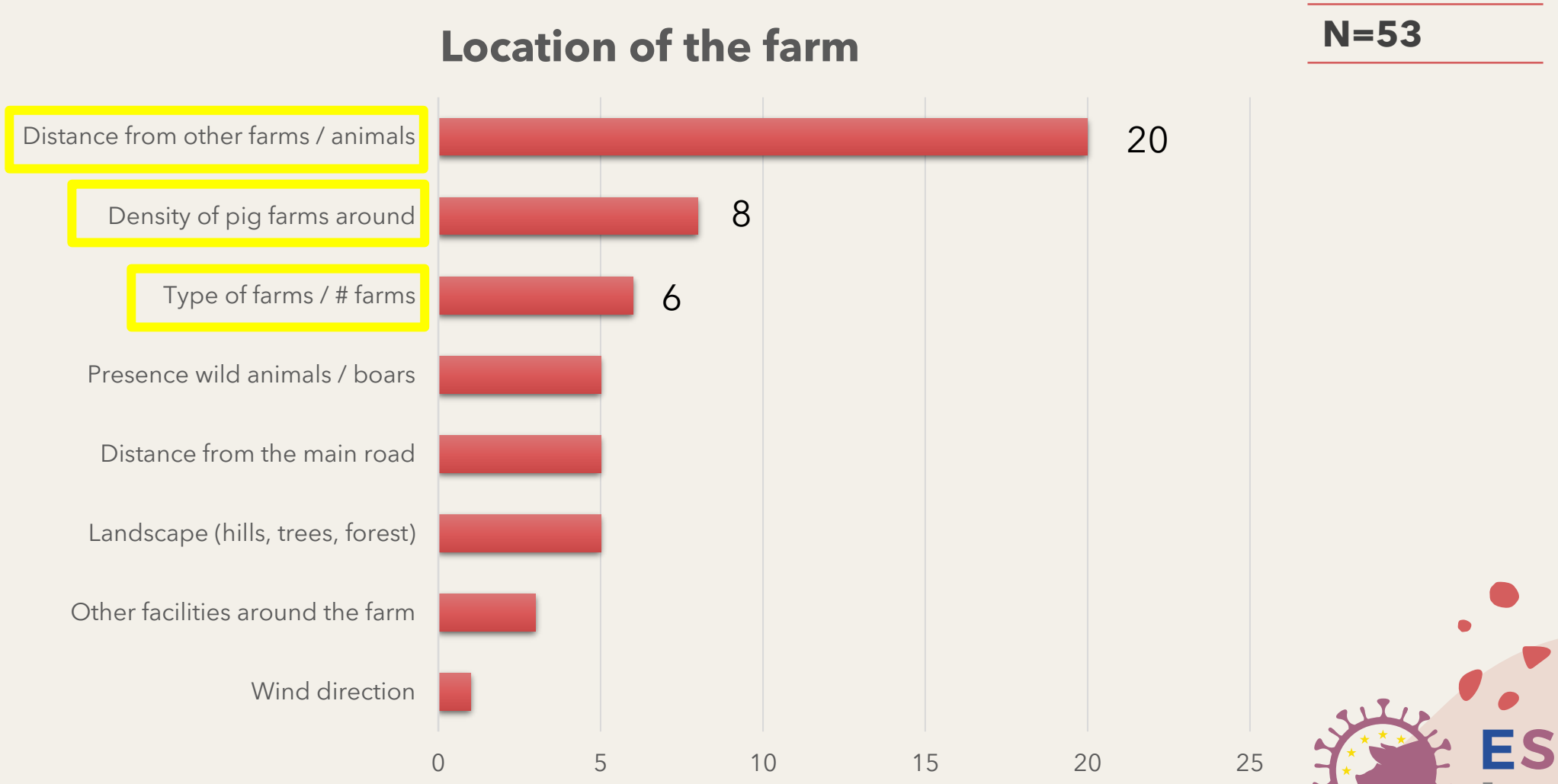


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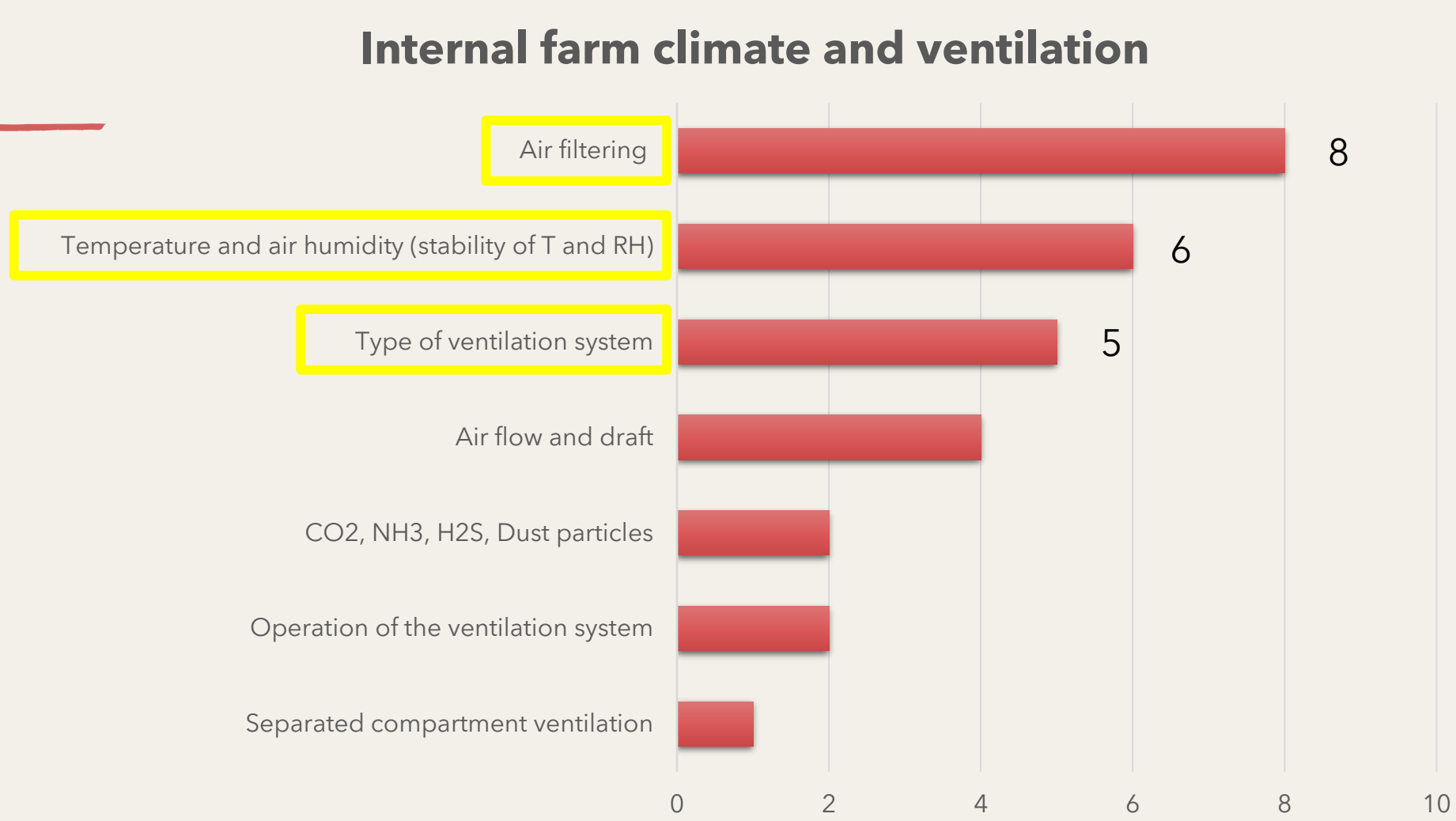


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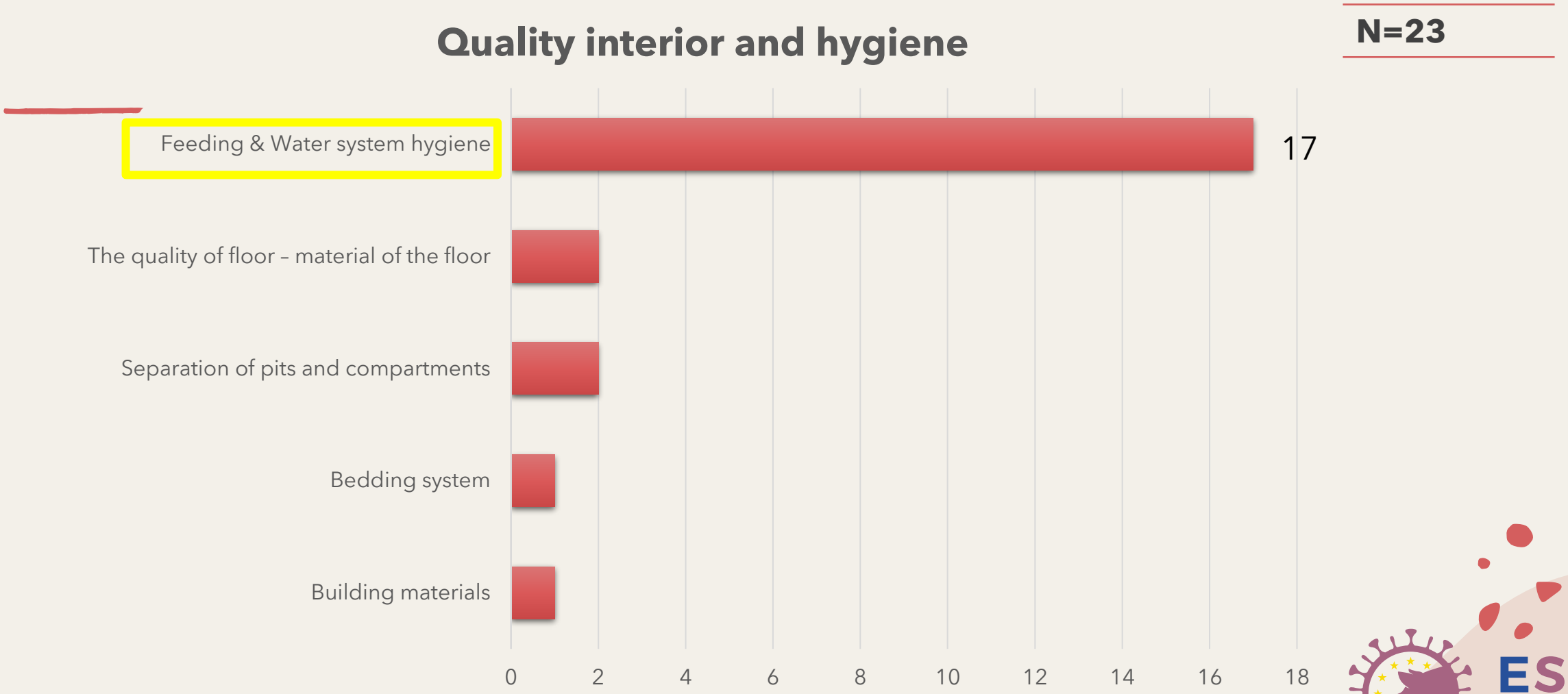


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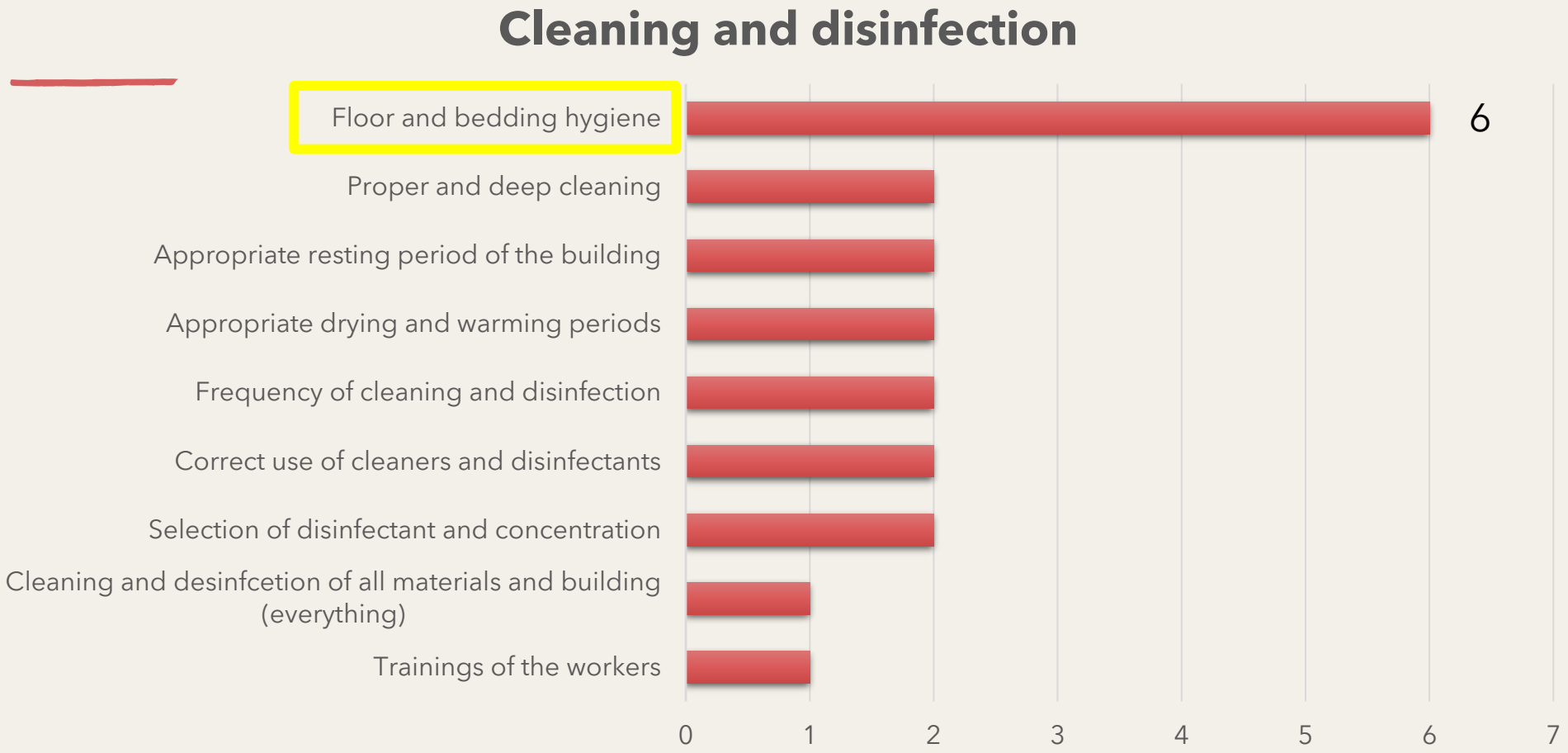
# 3. Results

N=20

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