BIG DATA IN ANTIMICROBIAL USE AND BIOSECURITY IN ANIMAL PRODUCTION, CURRENT STATE AND OPPORTUNITIES

Prof. Jeroen Dewulf

VETERINARY SCIENCES

ACADEMIC RANKING OF WORLD UNIVERSITIES SINCE 2003

No.1 2017 2018 2019 2020

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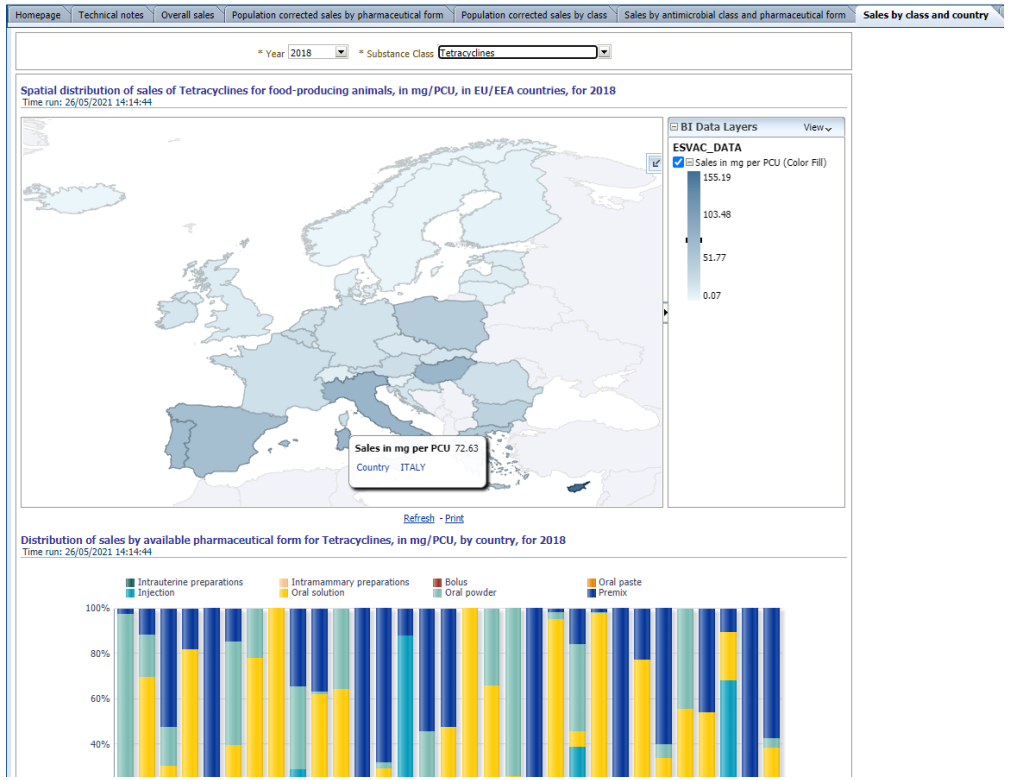
EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

ESVAC Database

Sales of veterinary antimicrobial agents in 31 European countries in 2018

Trends from 2010 to 2018

Tenth ESVAC report



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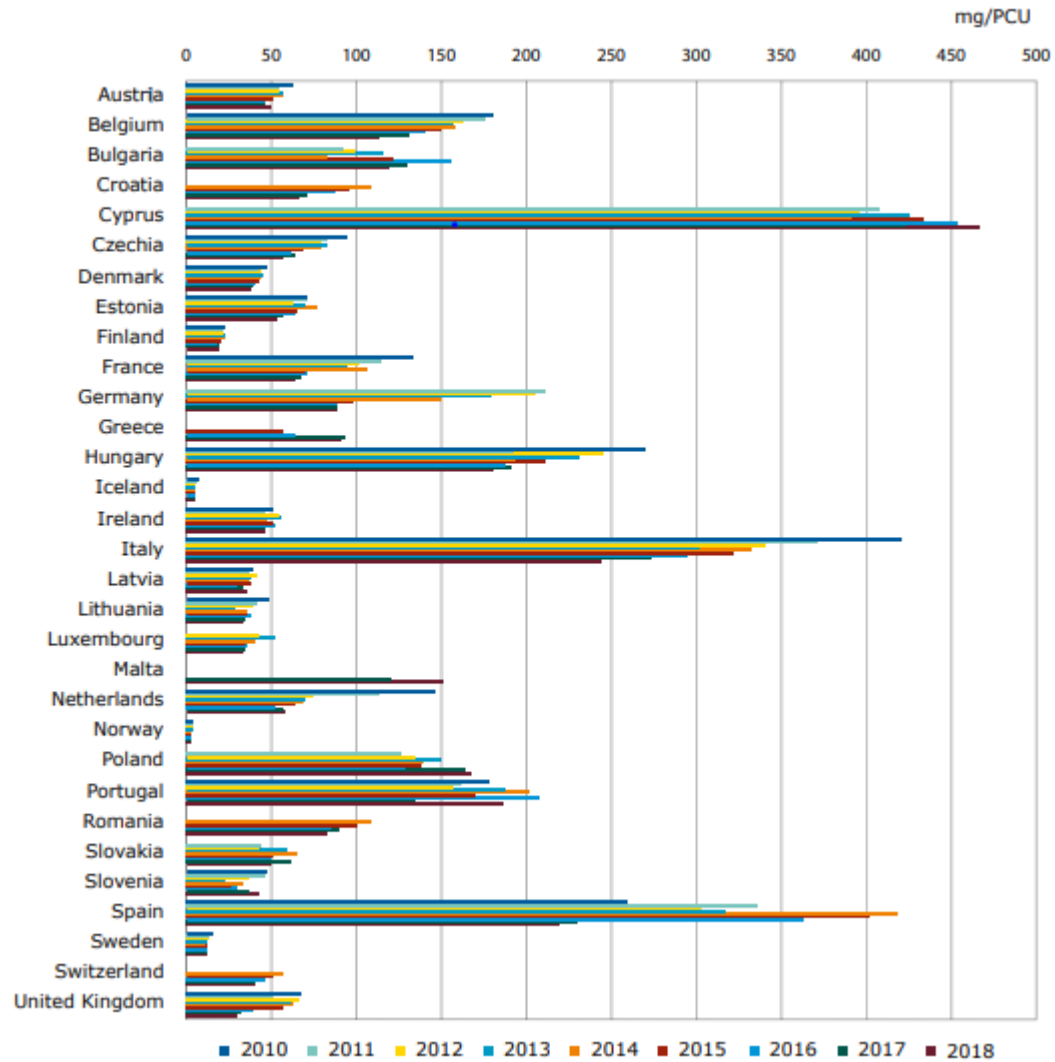

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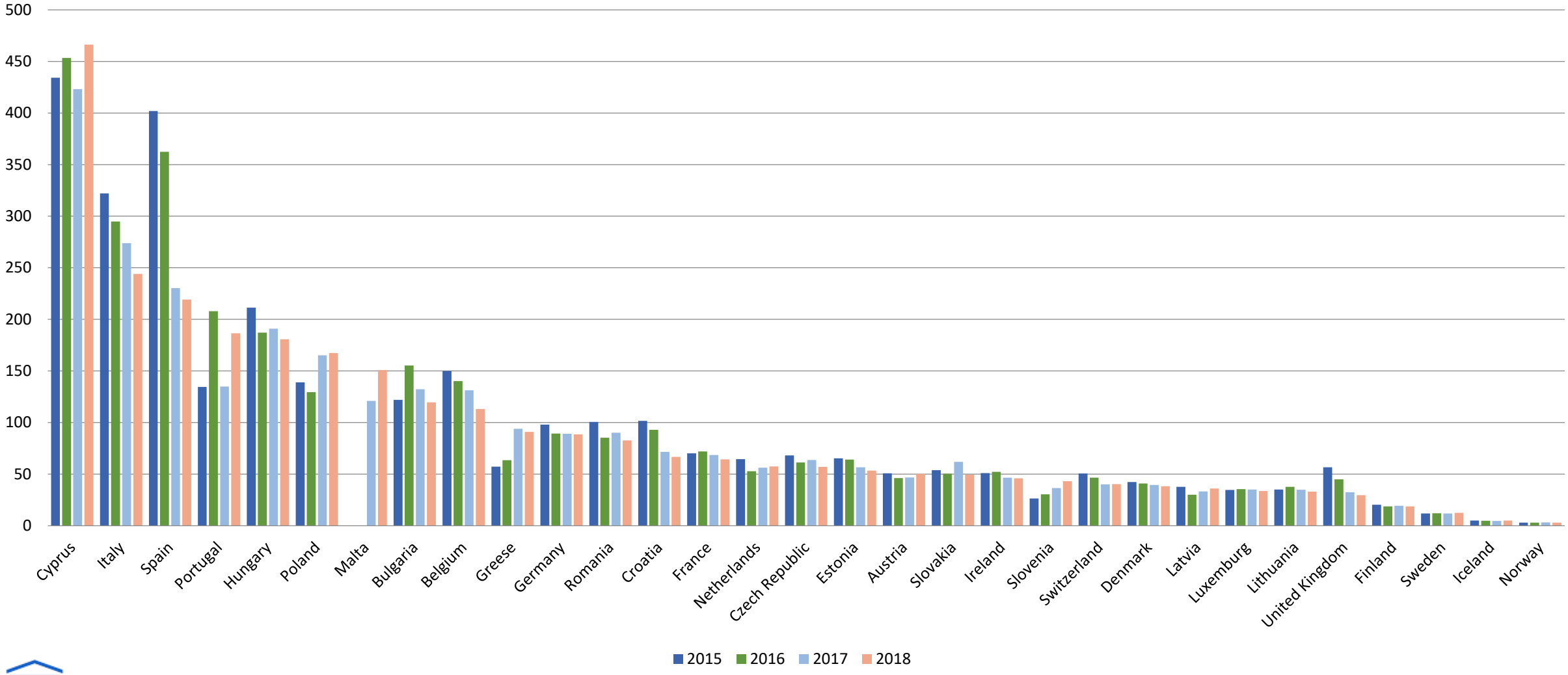
Antimicrobial use in mg/PCU (ESVAC)



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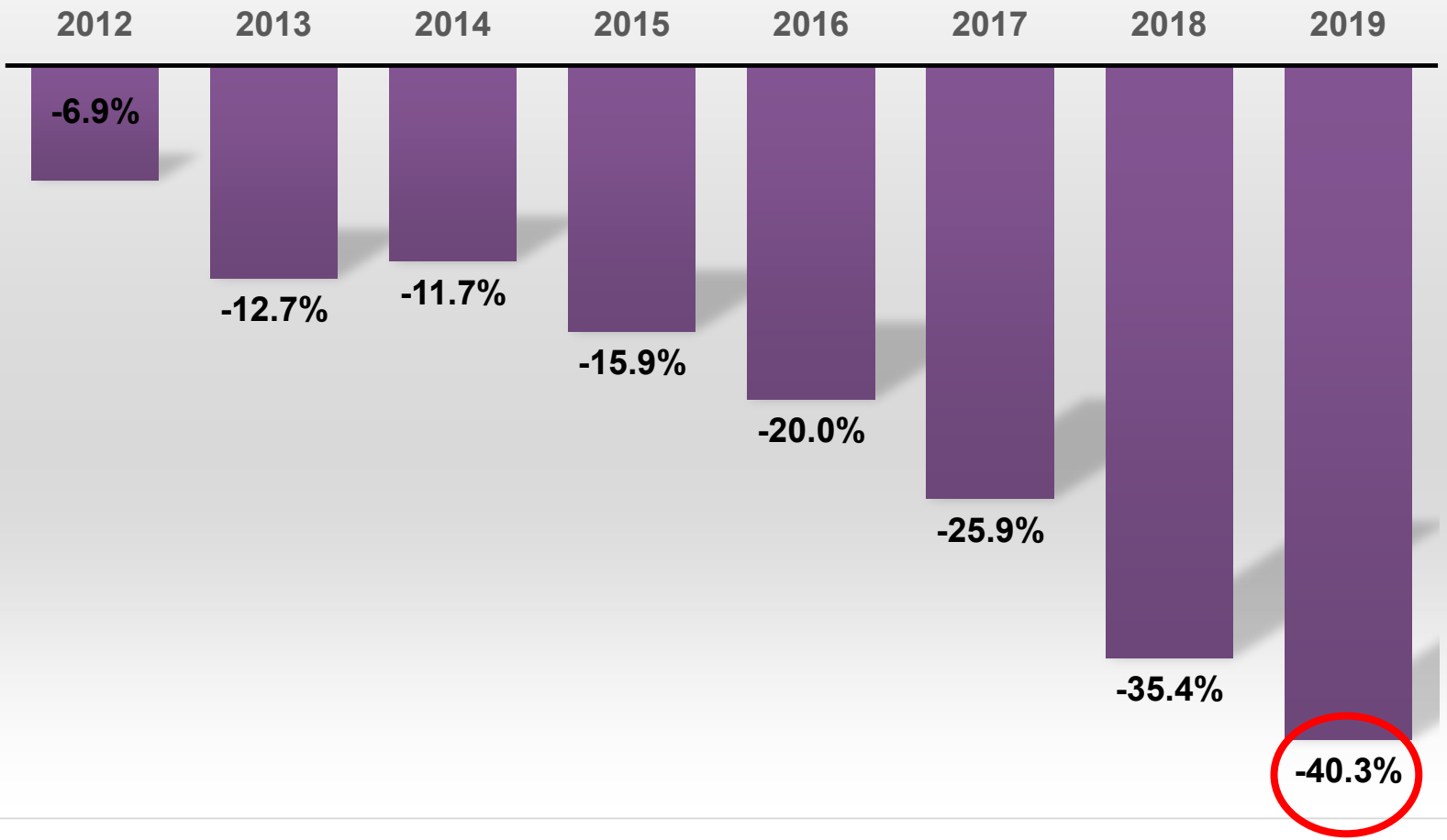
Evolution of antimicrobial consumption in animals per biomass compared to 2011 in Belgium



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fagg federaal agentschap voor geneesmiddelen en gezondheidsproducten

AACTING

Herd level antimicrobial consumption in animals

Collect | Analyze | Benchmark | Communicate

AACTING NETWORK ON MONITORING OF ANTIMICROBIAL USAGE IN ANIMALS

https://aacting.org/

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AACTING

Herd level antimicrobial consumption in animals

Collect | Analyze | Benchmark | Communicate

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16 countries

37 herd level data collection systems

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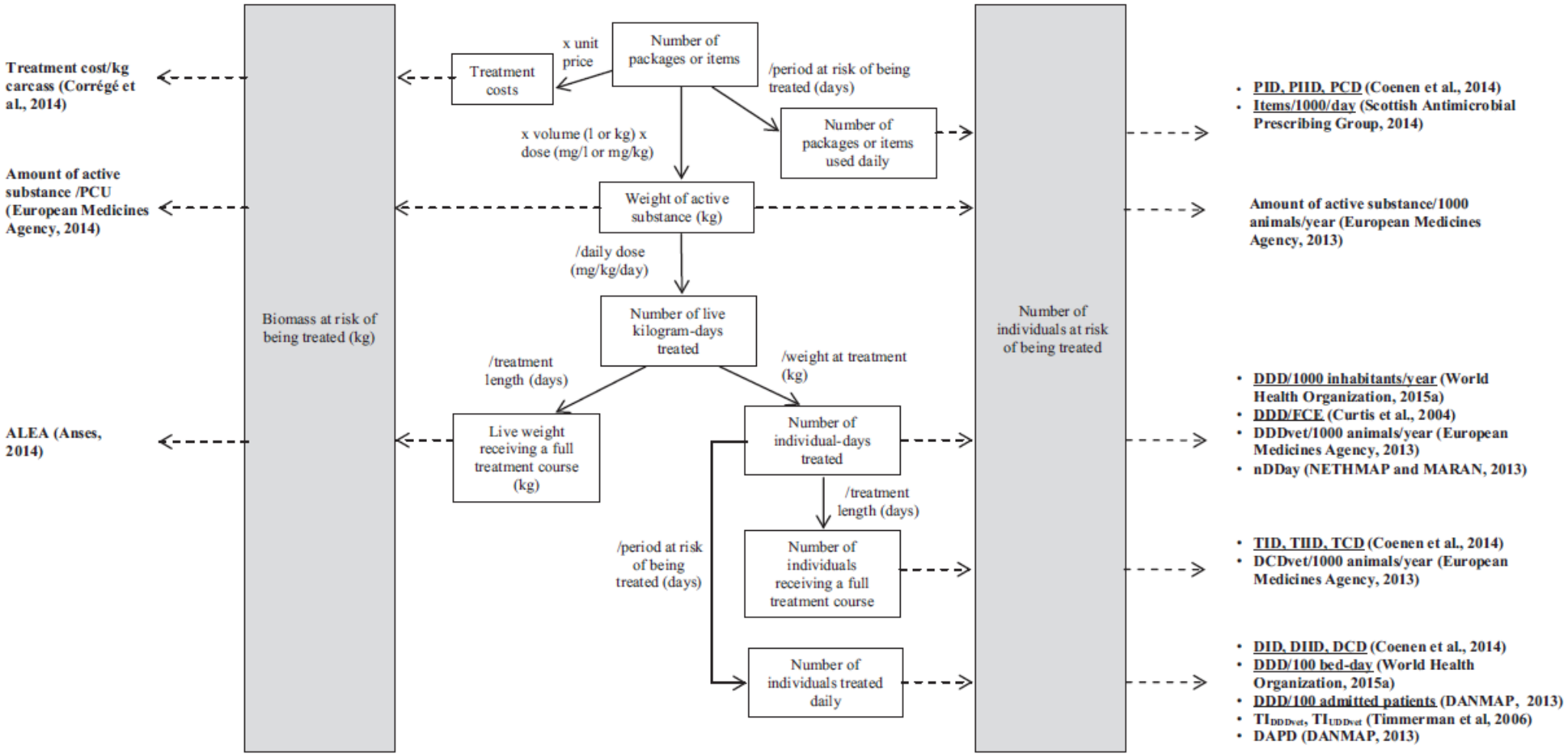
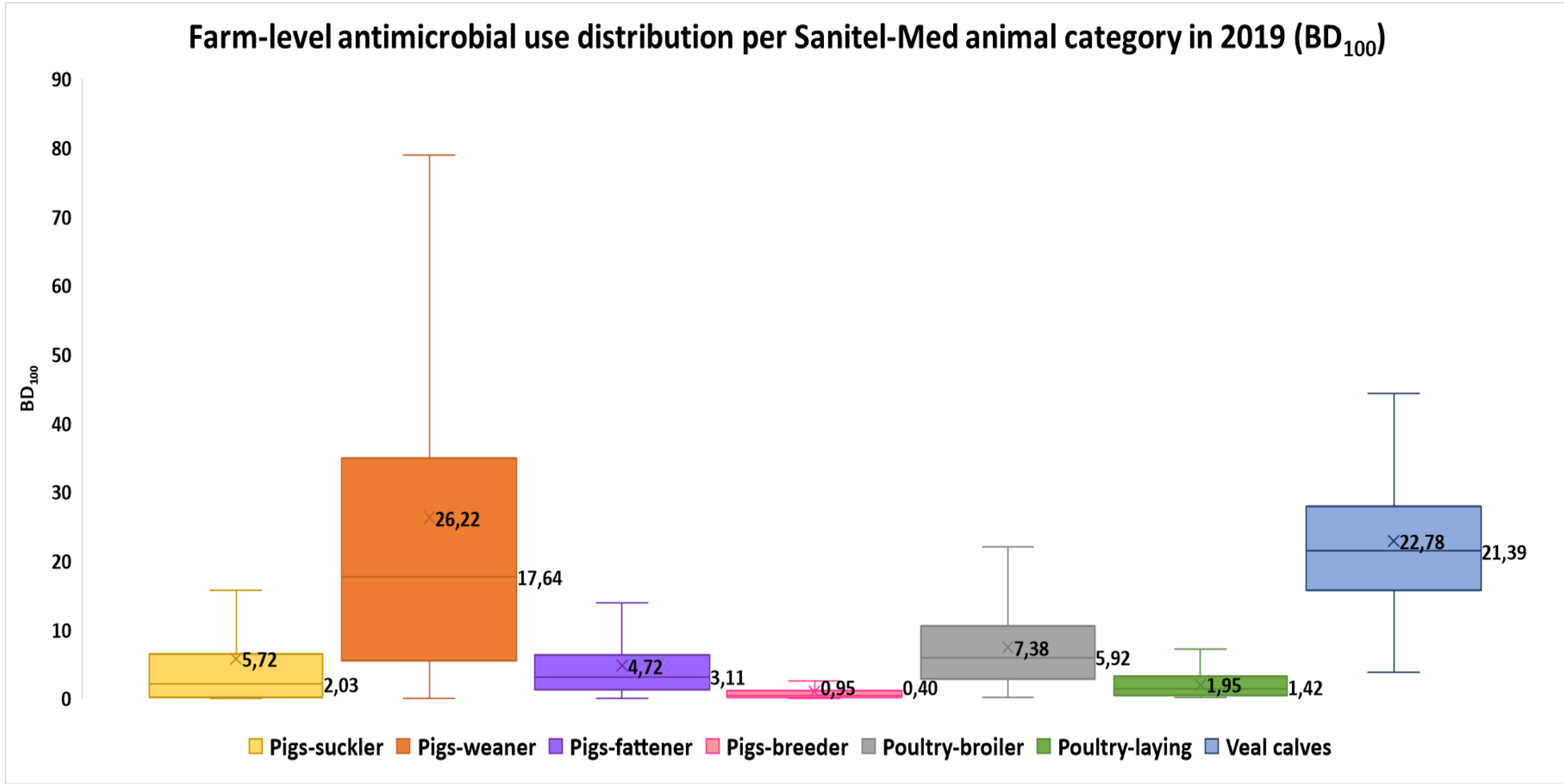
AMU CAN BE QUANTIFIED IN DIFFERENT WAYS



Zoonoses and Public Health, 2016



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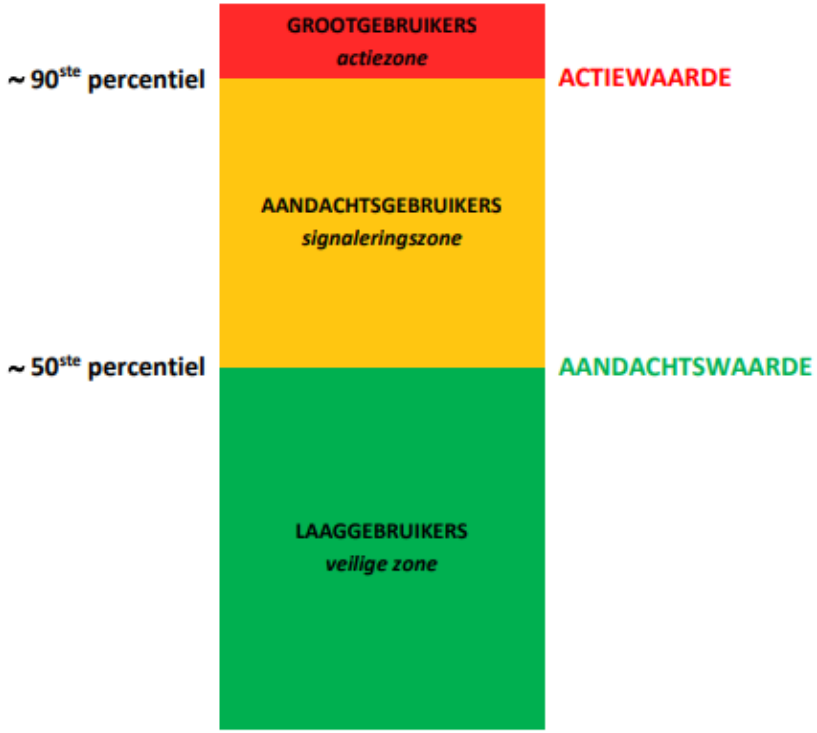
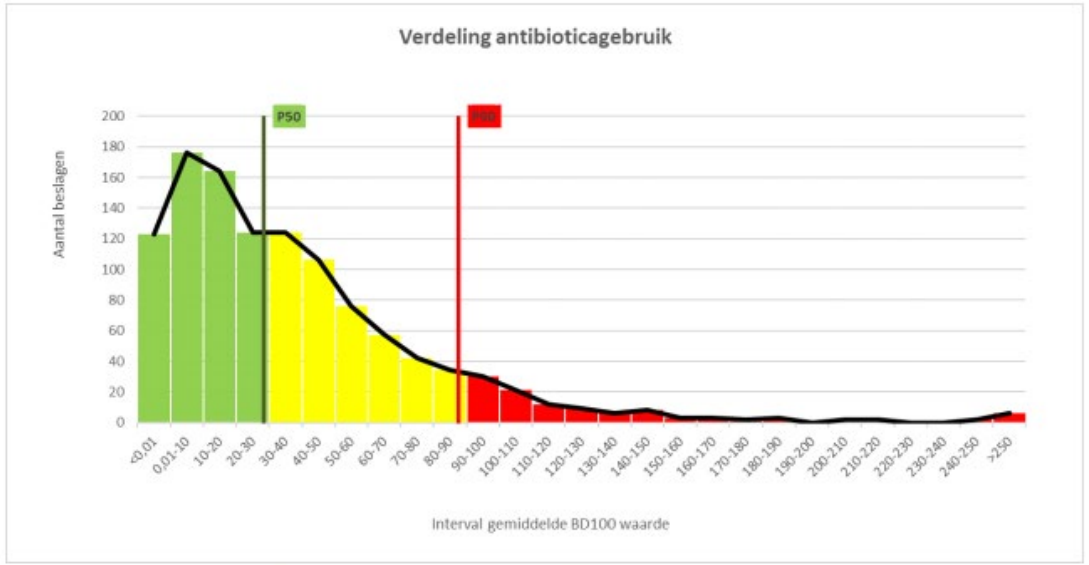
Data collection and benchmarking, for the benefit of **antimicrobial stewardship**



Figuur 1. Gebruikerscategorieën en grenswaarden voor antibioticagebruik in de veehouderij.



Figuur 2. Voorbeeld van een frequentieverdeling van het antibioticagebruik, met aanduiding van de grenswaarden en gebruikerscategorieën zoals getoond in Figuur 1.

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Herd level antimicrobial consumption in animals

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frontiers in Veterinary Science

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Monitoring of Farm-Level Antimicrobial Use to Guide Stewardship: Overview of Existing Systems and Analysis of Key Components and Processes

Pim Sanders [1†], Wannes Vanderhaeghen [2†], Mette Fertner [3], Klemens Fuchs [4], Walter Obritzhauser [5], Agnes Agunos [6], Carolee Carson [6], Birgitte Borck Høg [7], Vibe Dalhoff Andersen [8], Claire Chauvin [9], Anne Hémonic [10], Annemarie Käsbohrer [5,11], Roswitha Merle [12], Giovanni L. Alborali [13], Federico Scali [13], Katharina D. C. Stärk [14‡], Cedric Muentener [15], Ingeborg van Geijlswijk [1], Fraser Broadfoot [16], Lucie Pokludová [17], Clair L. Firth [5], Luis P. Carmo [18], Edgar Garcia Manzanilla [19,20], Laura Jensen [21], Marie Sjölund [22], Jorge Pinto Ferreira [14‡], Stacey Brown [16], Dick Heederik [1] and Jeroen Dewulf [23]*

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Agency

AACTING

Herd level antimicrobial consumption in animals

Collect | Analyze | Benchmark | Communicate

GUIDELINES

The AACTING consortium has drafted **practical guidelines** that are intended to provide useful support when **designing or revising farm-level AMU monitoring systems**. In addition, they might provide a **basis for future collection of harmonised farm-level data within and among countries**.

Contents:

- Background
- Purpose of the guidelines and target groups
- Definitions
- Practical guidelines
  - Data collection
  - Data analysis
  - Benchmarking
  - Reporting
- References
- Authors

Download the AACTING guidelines

The AACTING guidelines are closely linked to the **peer-reviewed overview** of systems for monitoring farm-level antimicrobial use, that was published as part of the AACTING project.

FIND IT HERE!

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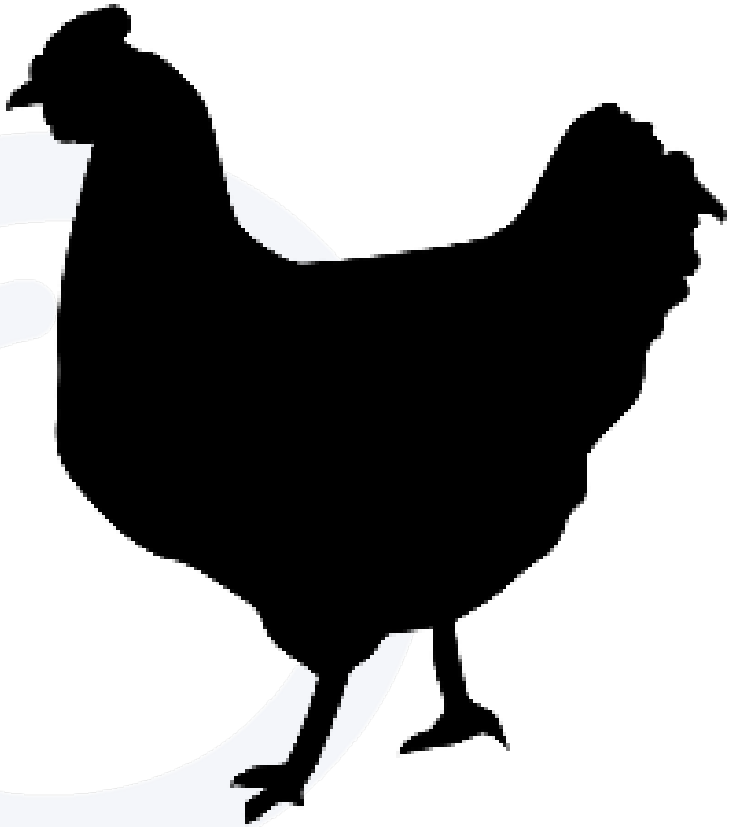
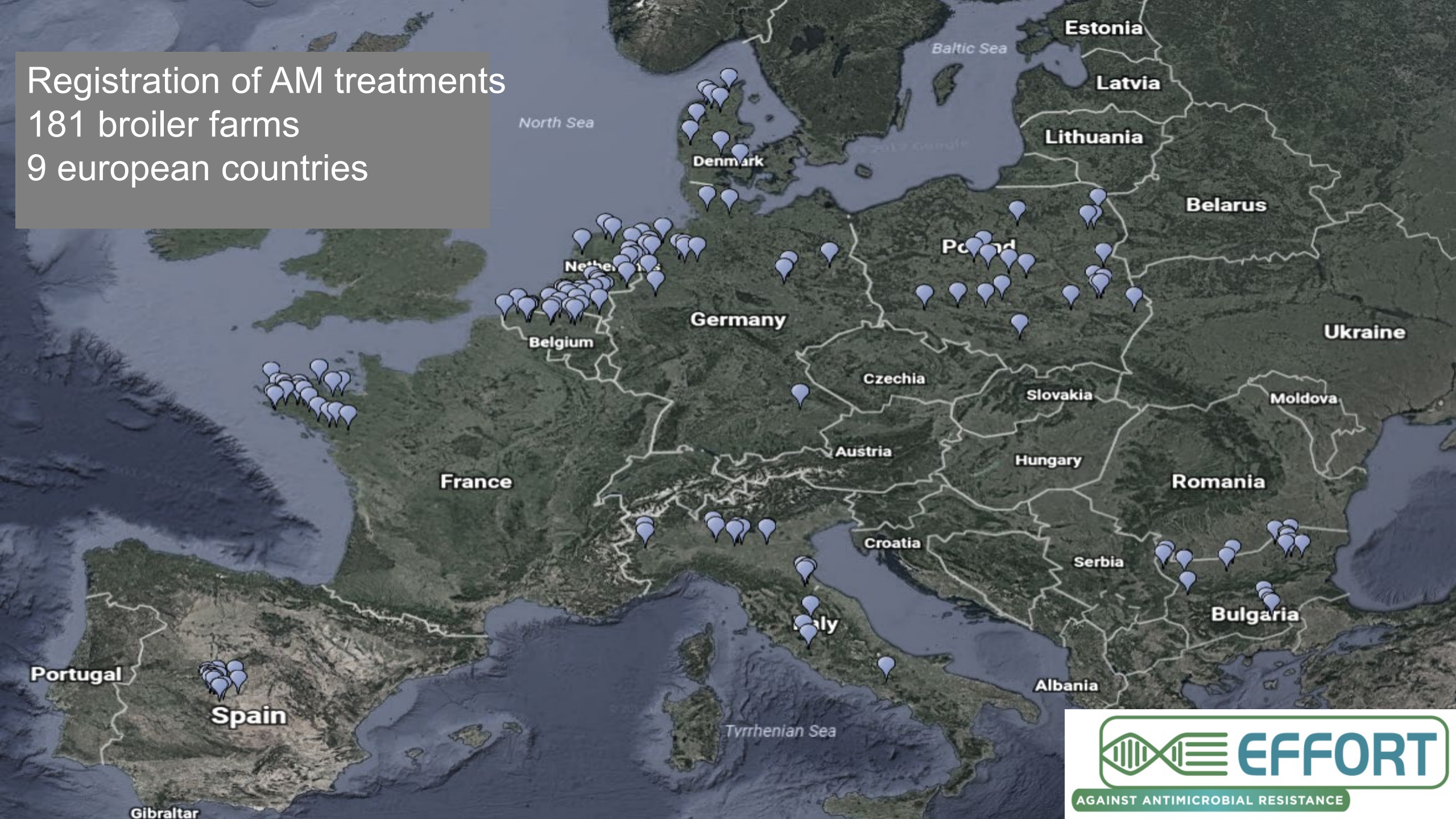
AMU ON BROILER FARMS



Joosten et al., 2019. “Quantitative and Qualitative Analysis of Antimicrobial Usage at Farm and Flock Level on 181 Broiler Farms in Nine European Countries.” Journal of Antimicrobial Chemotherapy 74 (3): 798–806.


Registration of AM treatments
181 broiler farms
9 european countries
Estonia
Baltic Sea
Latvia
North Sea
Lithuania
Denmark
Belarus
Germany
Ukraine
Belgium
Czechia
Slovakia
Moldova
Austria
Hungary
France
Romania
Croatia
Serbia
Bulgaria
Portugal
Spain
Albania
Tyrrhenian Sea
Gibraltar
EFFORT
AGAINST ANTIMICROBIAL RESISTANCE

Usage on the median farm

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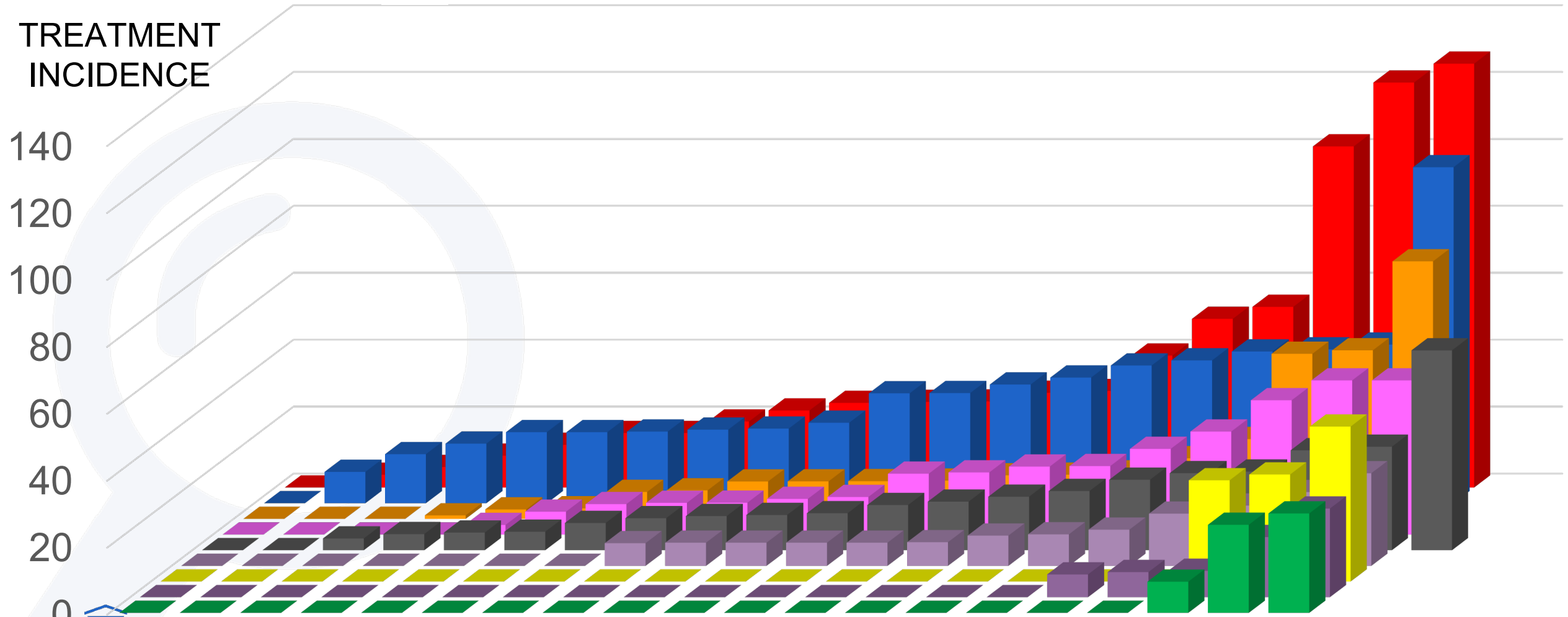
FARM

EFFORT AGAINST ANTIMICROBIAL RESISTANCE

Variation in usage over farms



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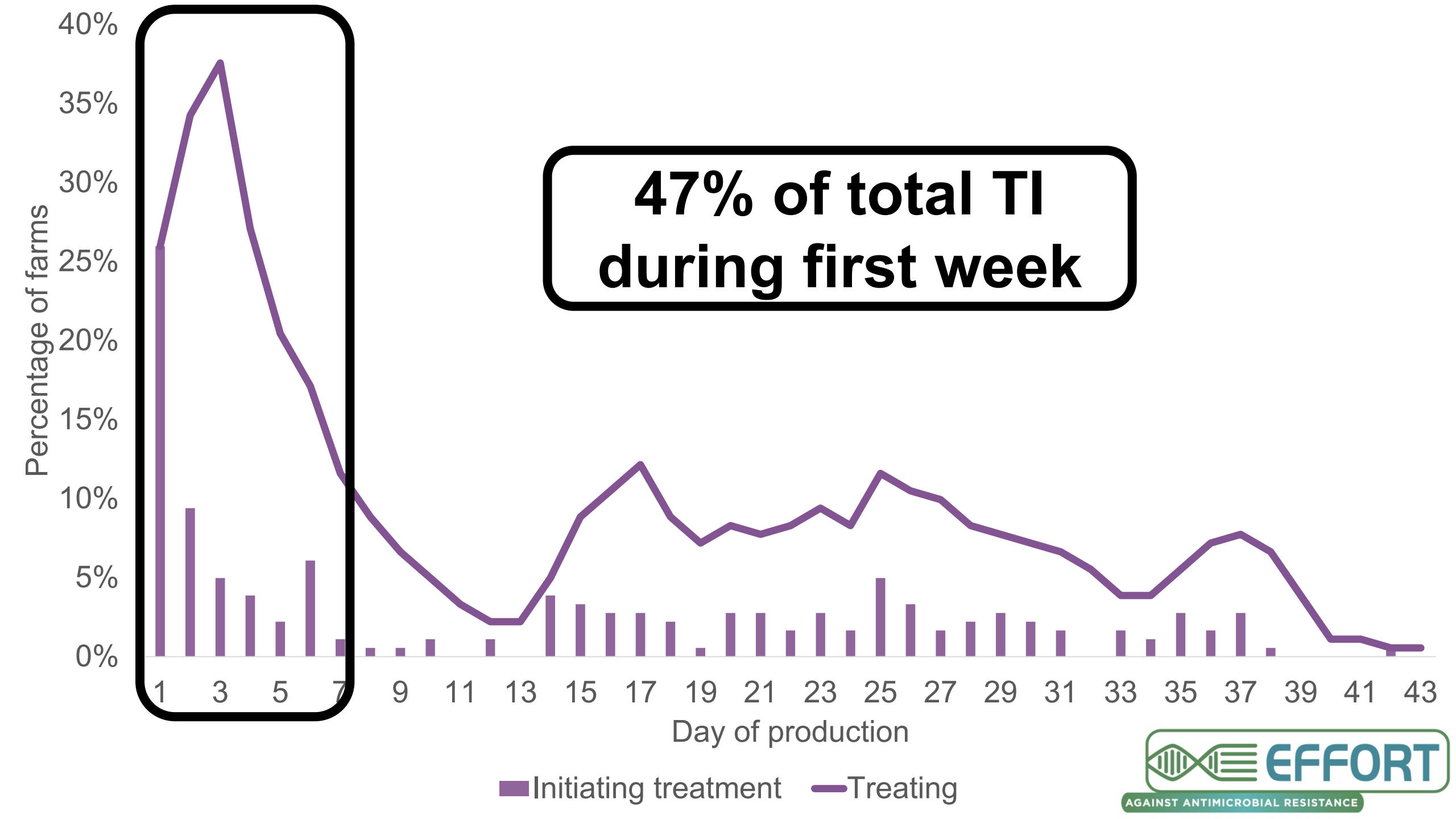
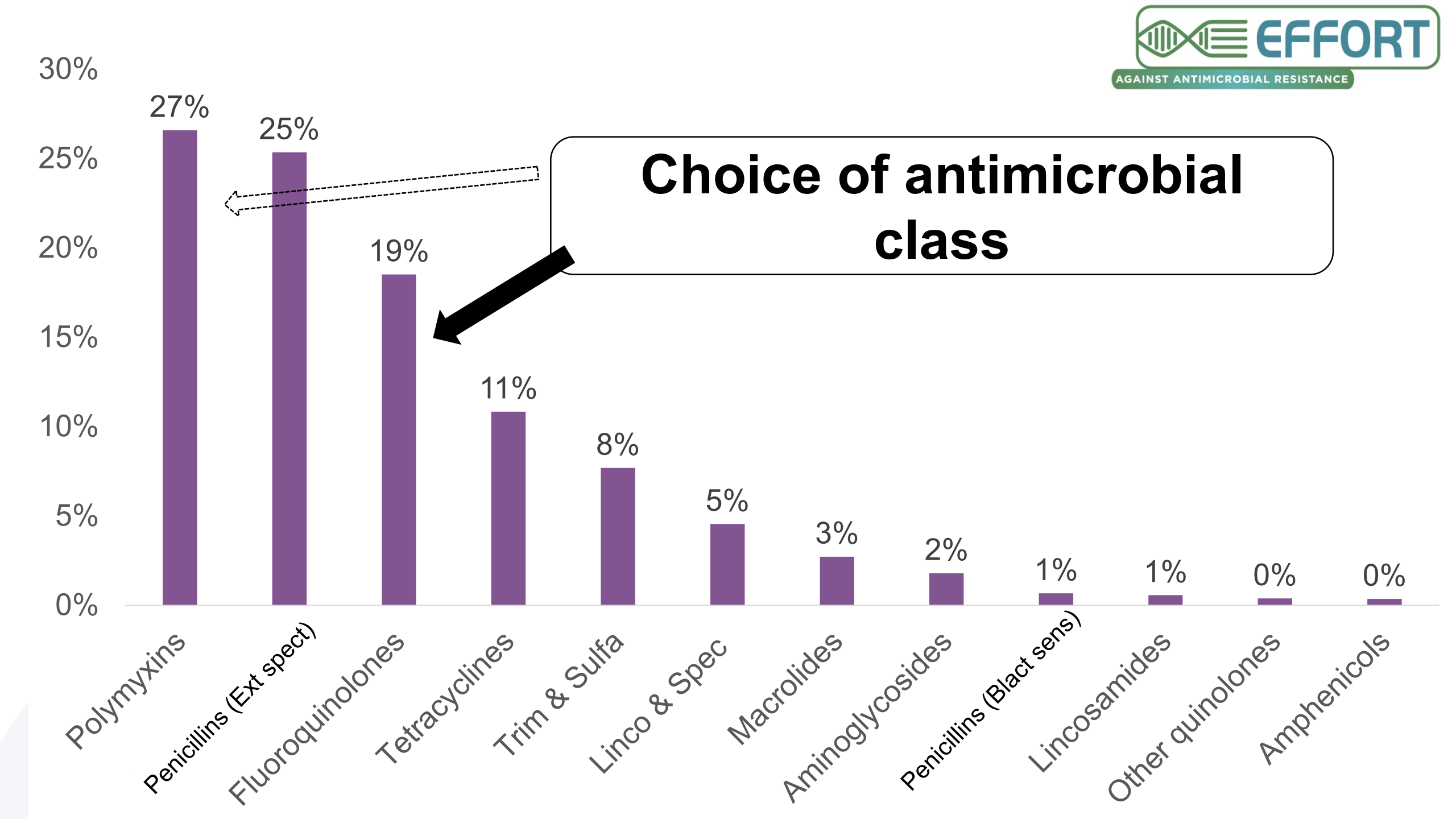
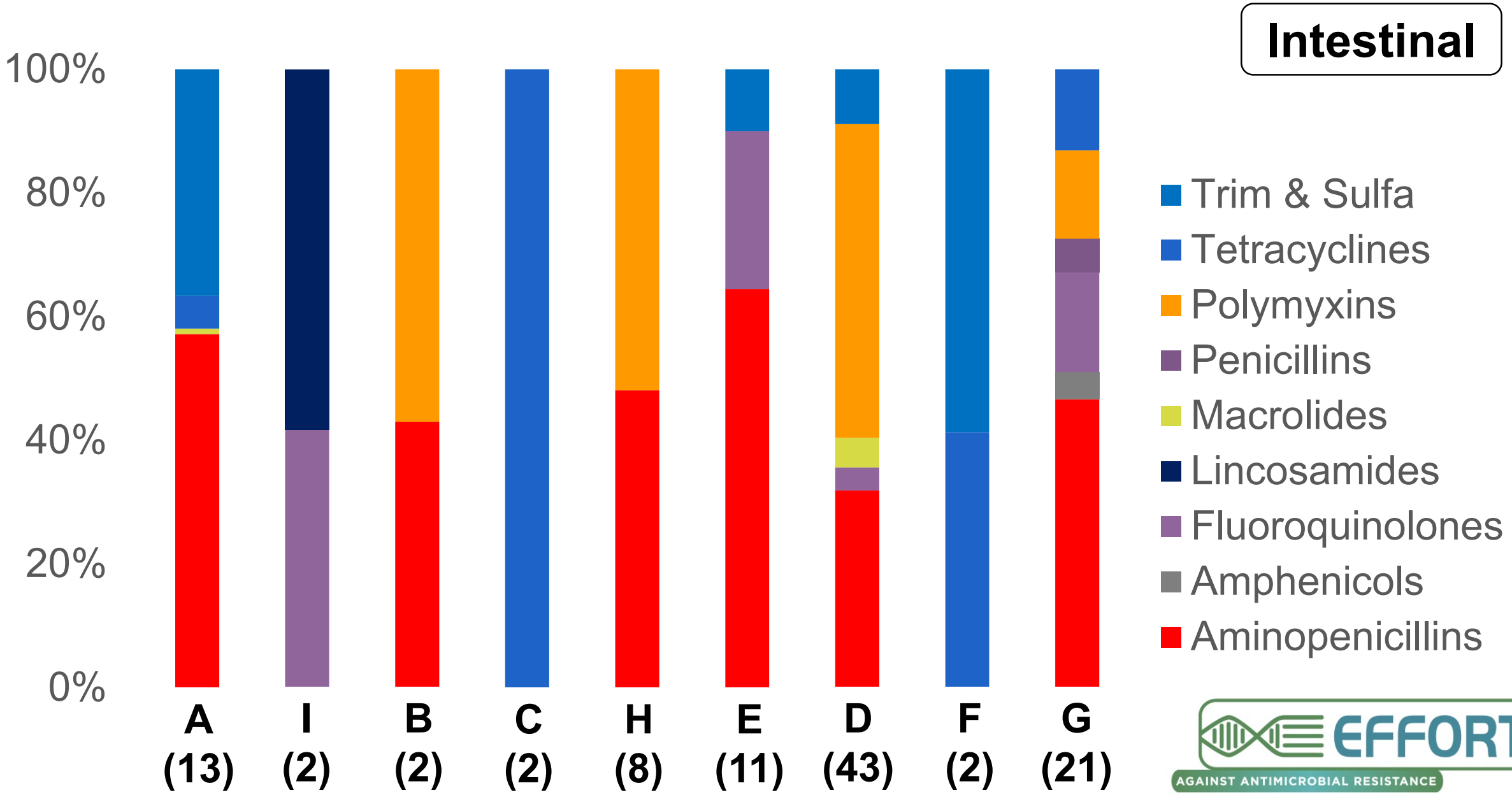
EFFORT
AGAINST ANTIMICROBIAL RESISTANCE



EFFORT
AGAINST ANTIMICROBIAL RESISTANCE

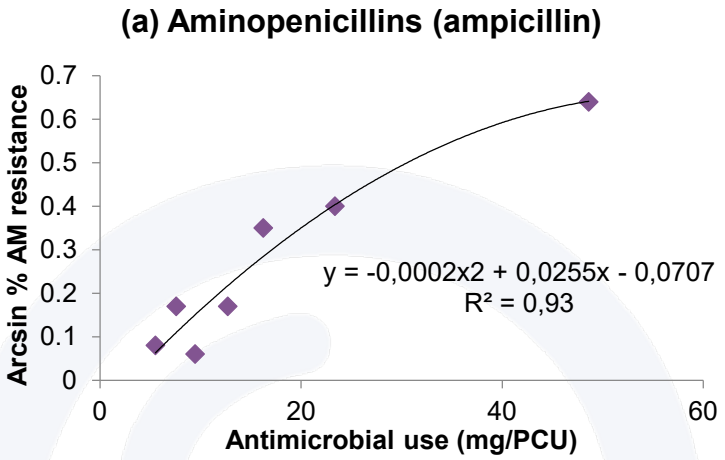

EFFORT
AGAINST ANTIMICROBIAL RESISTANCE
Choice of antimicrobial class
30%
25%
20%
15%
10%
5%
0%
27%
25%
19%
11%
8%
5%
3%
2%
1%
1%
0%
0%
Polymyxins
Penicillins (Ext spect)
Fluoroquinolones
Tetracyclines
Trim & Sulfa
Linco & Spec
Macrolides
Aminoglycosides
Penicillins (Blact sens)
Lincosamides
Other quinolones
Amphenicols

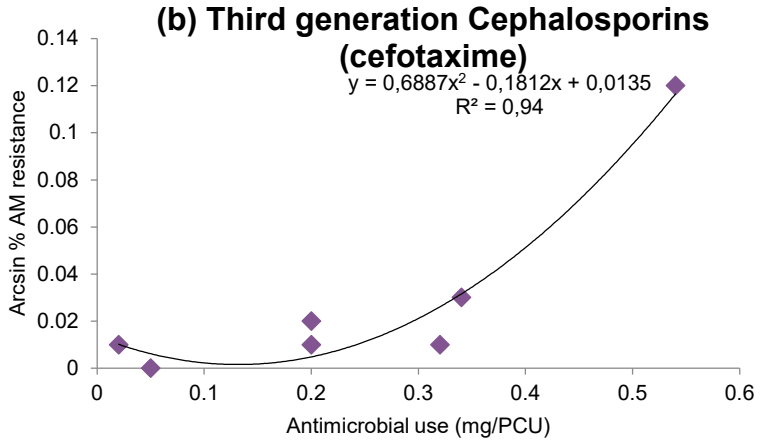
RANDOMNESS IN CHOICE OF ACTIVE SUBSTANCE

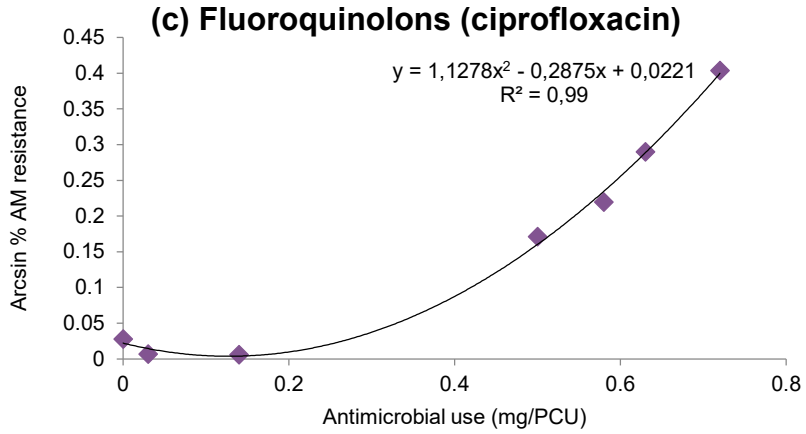


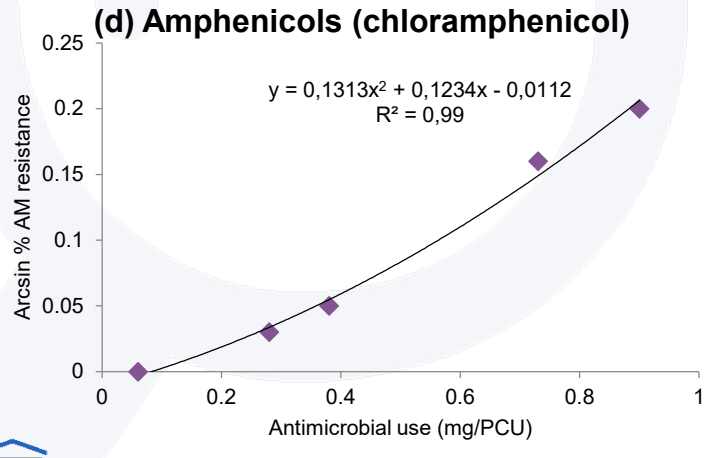
EFFORT
AGAINST ANTIMICROBIAL RESISTANCE

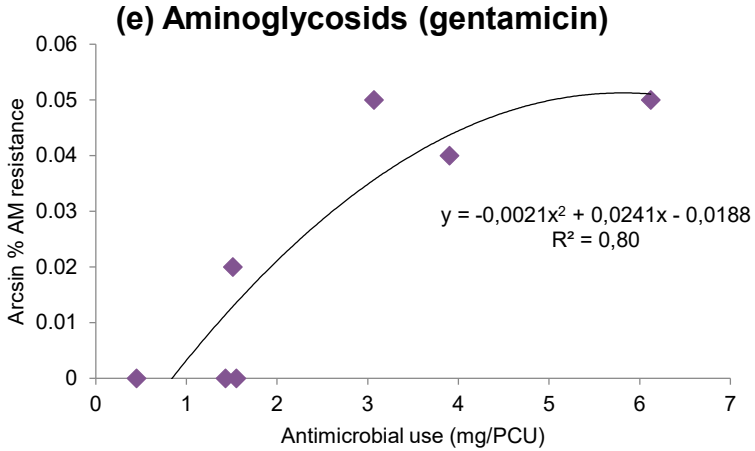
Linking antimicrobial use to antimicrobial resistance in 7 EU countries based on monitoring data

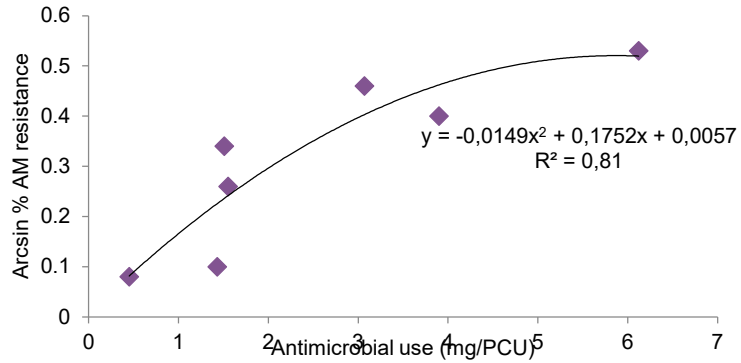












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Chantziaras et al., J Antimicrob Chemother, 2014

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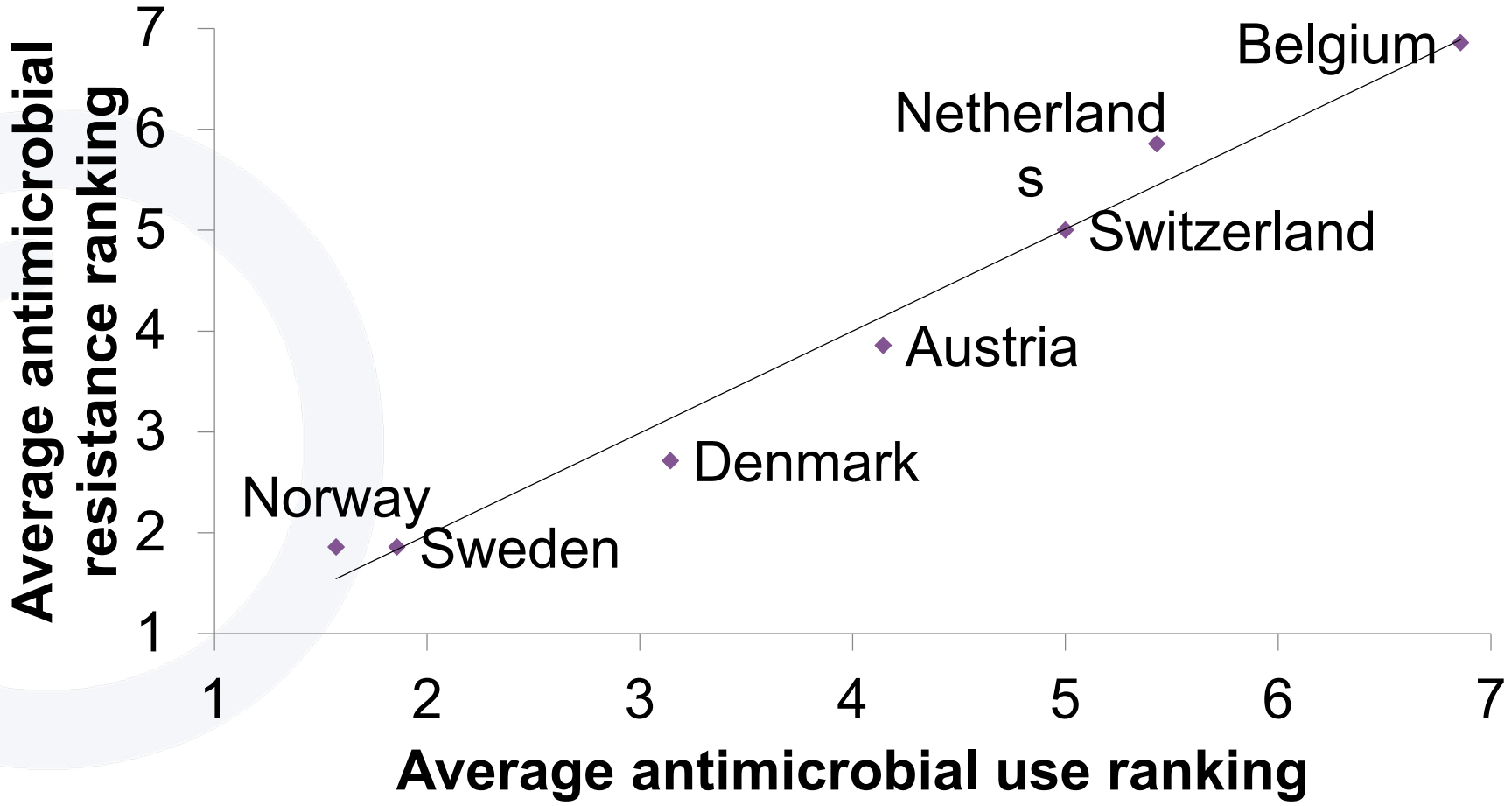
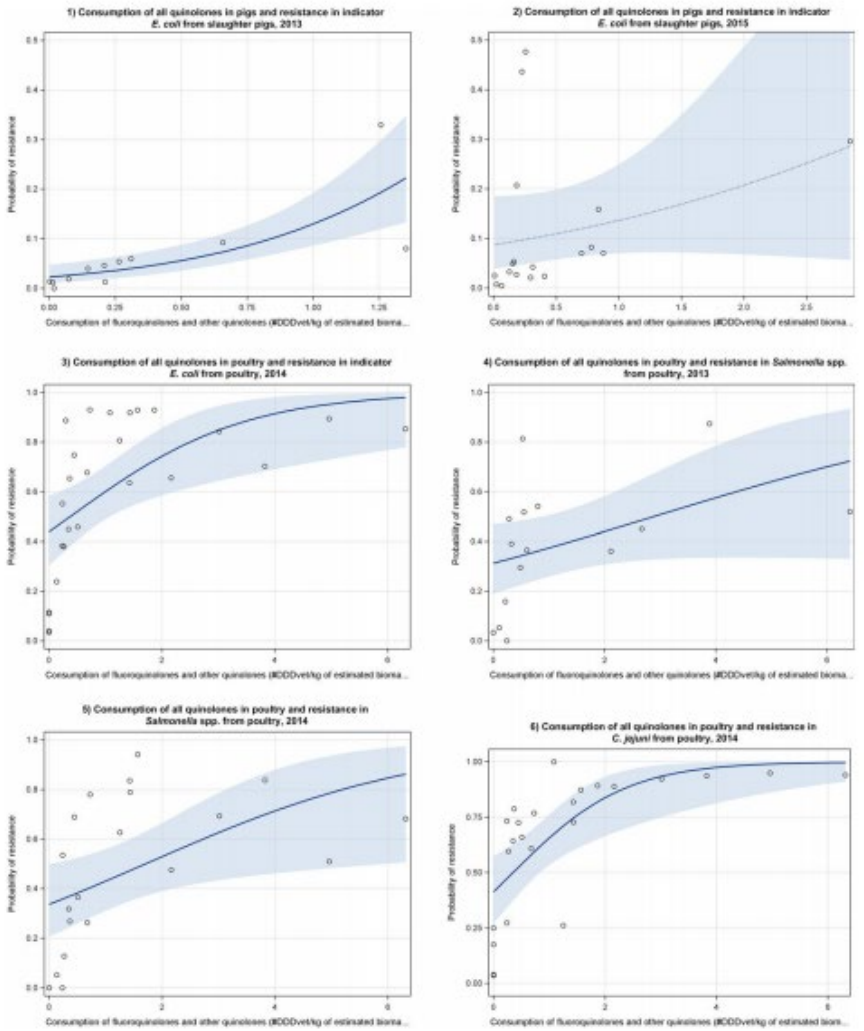
Linking antimicrobial use to antimicrobial resistance in 7 EU countries based on monitoring data



Chantziaras et al., J Antimicrob Chemother, 2014



Dots represent the countries involved in the analysis. The category 'poultry' includes broilers for 2013 and broilers and turkeys for 2014. The scale used in graphs (5) and (6) is adapted according to the range of probabilities of resistance observed, in order to best show the distribution of data points. In graph (6), the dashed curve means that the corresponding association is not significant, although it becomes significant while disregarding the three outlying dots in the upper left hand corner of the graph.

Figure 20: Logistic regression analysis curves of the estimated consumption of all quinolones in pigs and the probability of resistance to ciprofloxacin in indicator *E. coli* from slaughter pigs in 2013 (1) and 2015 (2), and of the estimated consumption of all quinolones in poultry and the probability of resistance to ciprofloxacin in indicator *E. coli* from poultry in 2014 (3), in *Salmonella* spp. from poultry in 2013 (4) and 2014 (5) and in *Campylobacter jejuni* from poultry in 2014 (6) (see also Table 18)

Linking antimicrobial use to antimicrobial resistance

2° JIACRA report

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by the European Medicines

Biosecurity ?

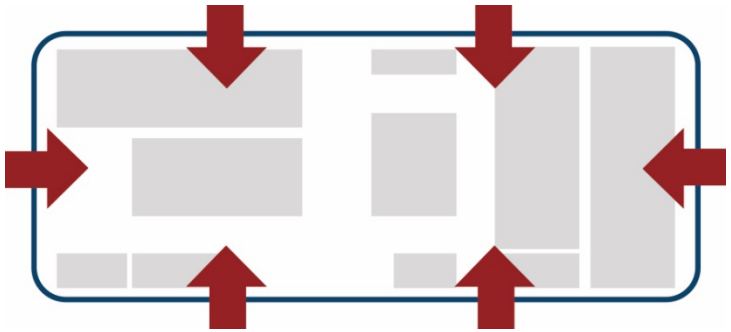
EXTERNAL BIOSECURITY

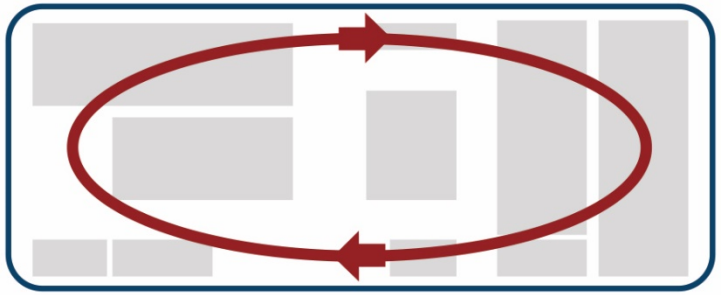
= Reduce introduction

- endemic diseases
- ”exotic” diseases

INTERNAL BIOSECURITY

= reduce spread





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Why biosecurity?

BIOSECURITY is (should be) the basis of any disease control program

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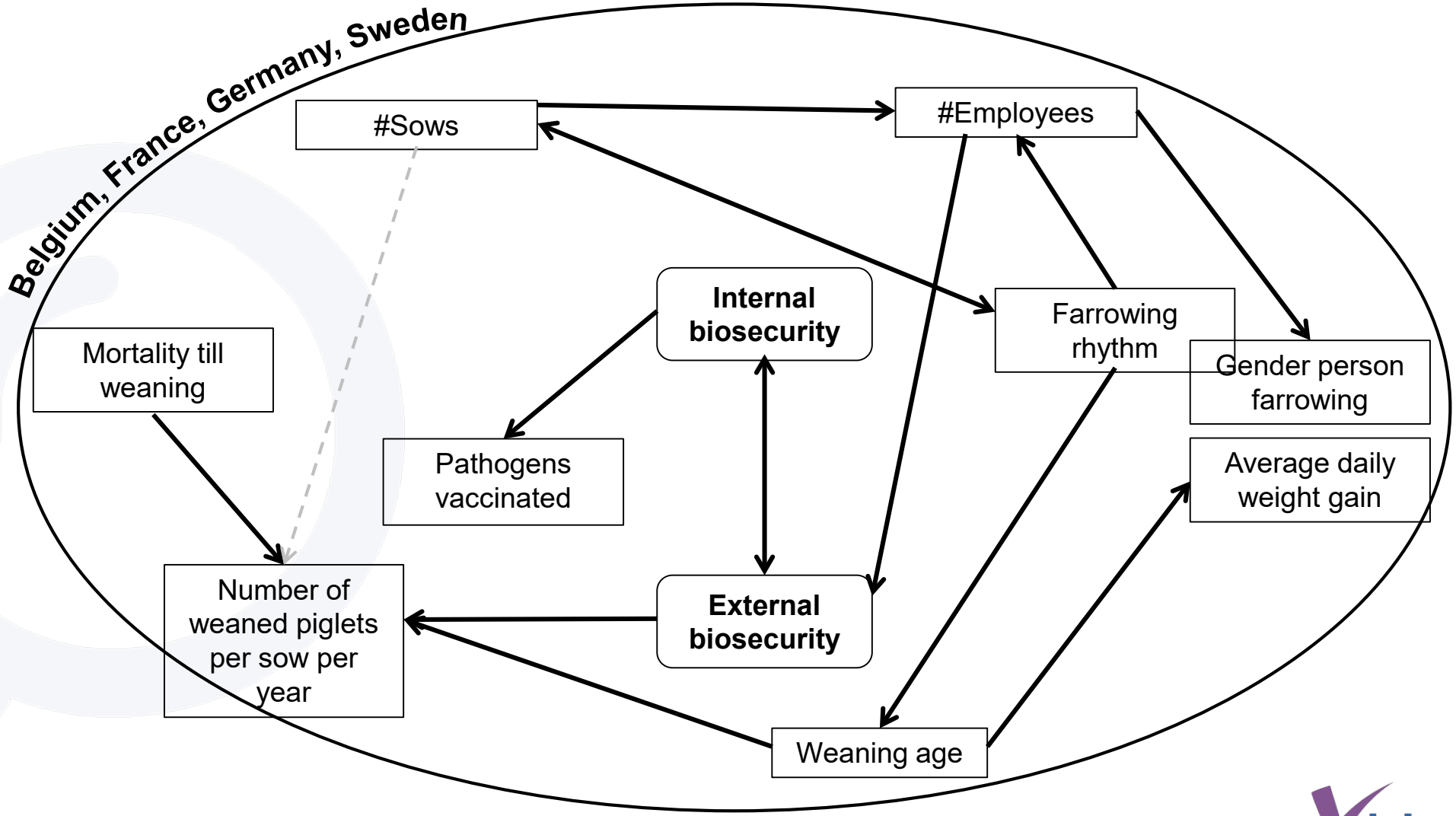
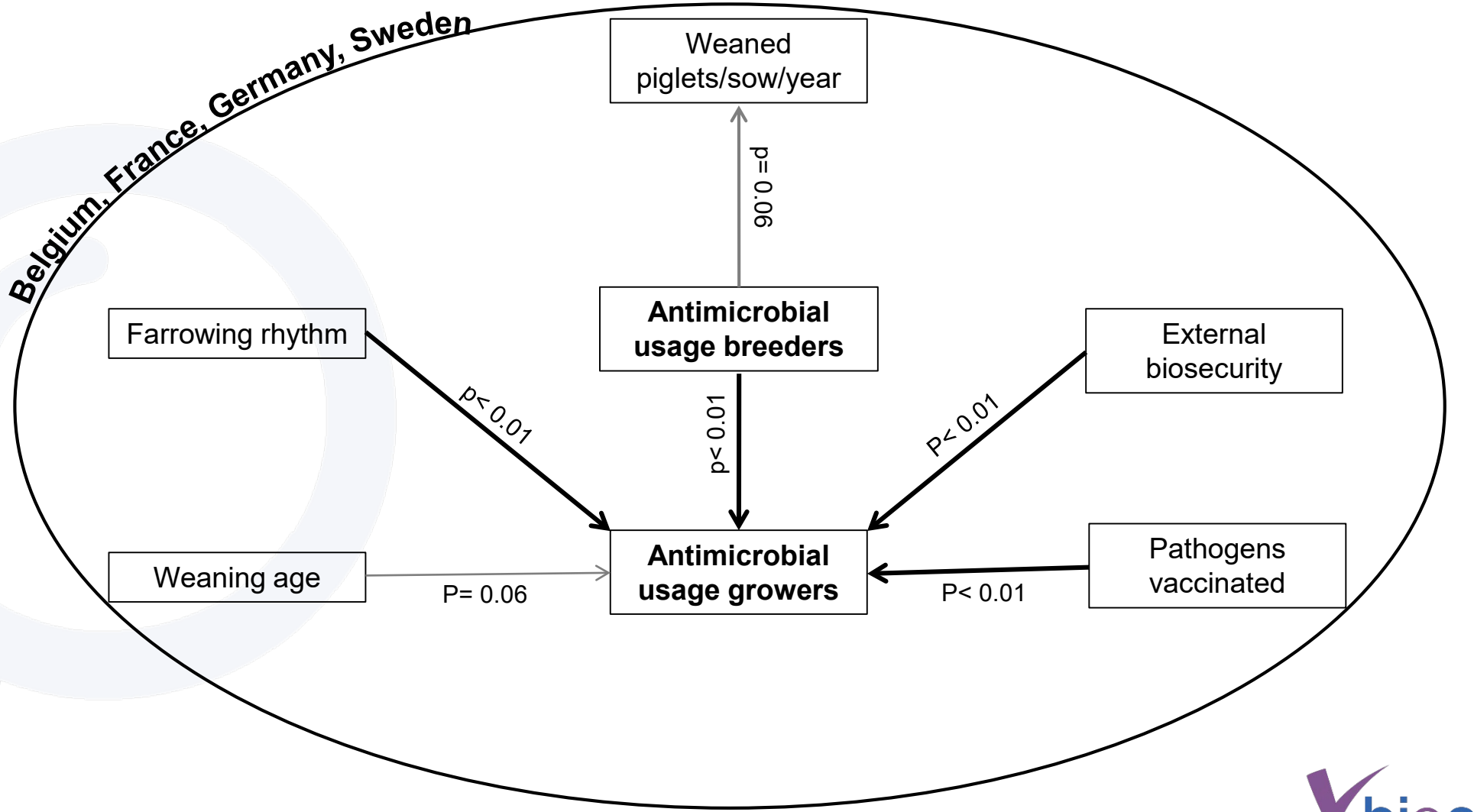
Biosecurity, health and production

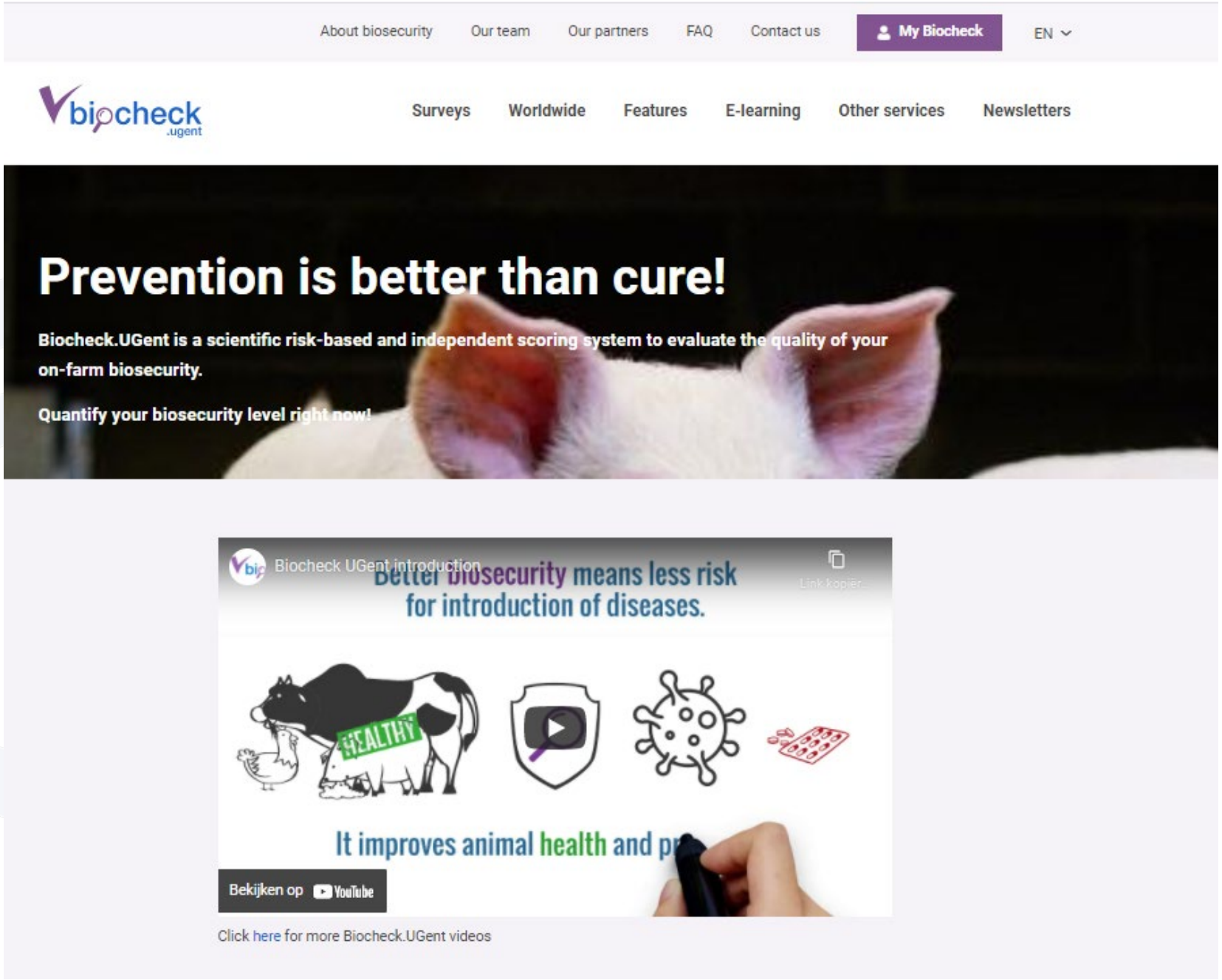


Postma et al., 2016

Biosecurity, antimicrobial use



Postma et al., 2016



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Worldwide usage of Biocheck.UGent

The Biocheck.UGent has already been used **16302** times to evaluate the biosecurity in farms worldwide.

→ **Worldwide statistics**

10404 4294 1604

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PIG

Nr	Description	Score	Country average
External biosecurity			
A	Purchase of animals and semen	56 %	89 %
B	Transport of animals, removal of manure and dead animals	57 %	70 %
C	Feed, water and equipment supply	87 %	39 %
D	Personnel and visitors	76 %	64 %
E	Vermin and bird control	60 %	63 %
F	Environment and region	30 %	52 %
	Subtotal External biosecurity:	***62 %***	***66 %***
Internal biosecurity			
A	Disease management	60 %	58 %
B	Farrowing and suckling period	79 %	60 %
C	Nursery unit	86 %	65 %
D	Fattening unit	43 %	72 %
E	Measures between compartments and the use of equipment	68 %	44 %
F	Cleaning and disinfection	95 %	48 %
	Subtotal Internal biosecurity:	***73 %***	***55 %***
N/A = Not applicable	**Total:**	**68 %**	**61 %**

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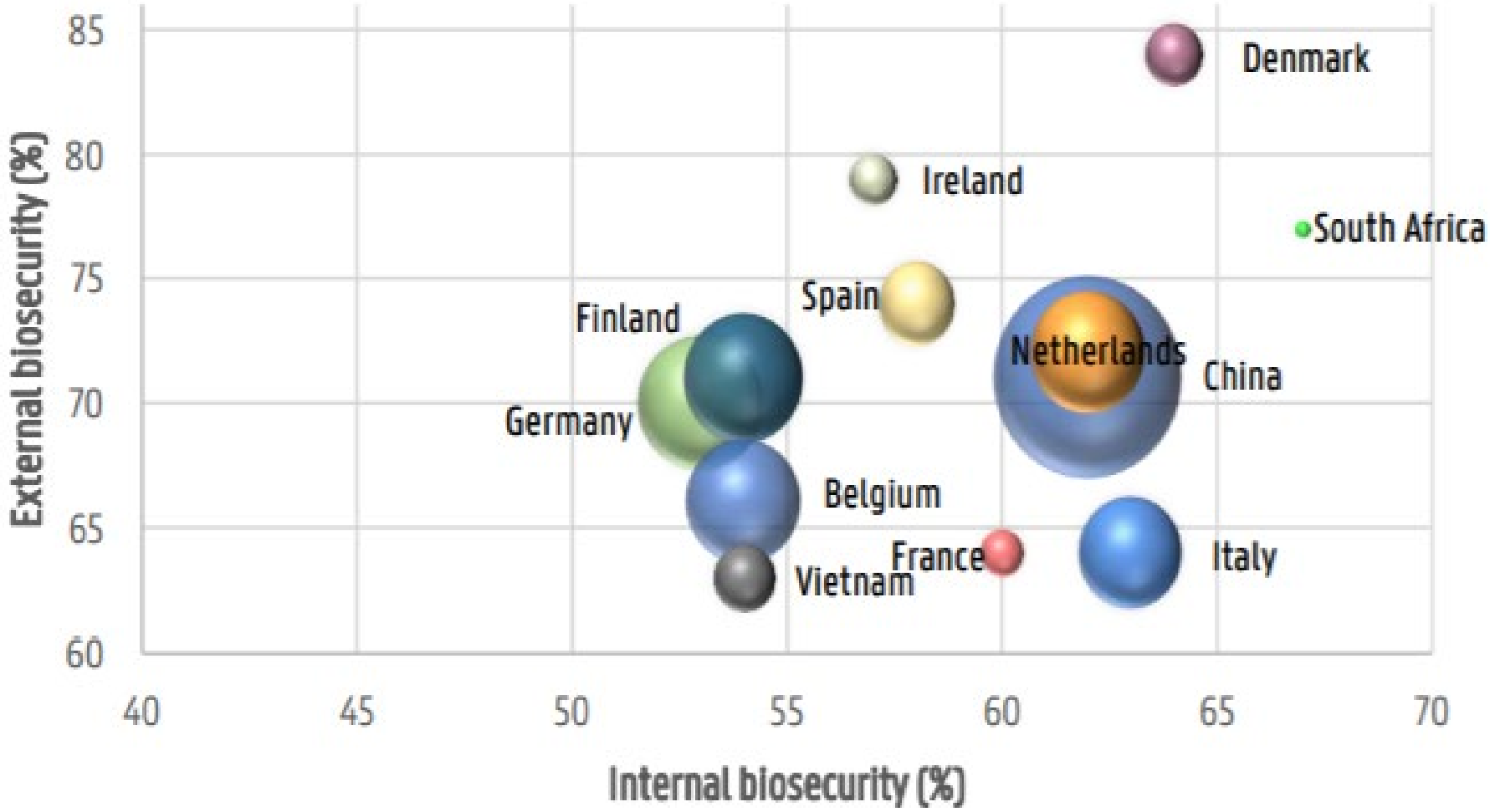

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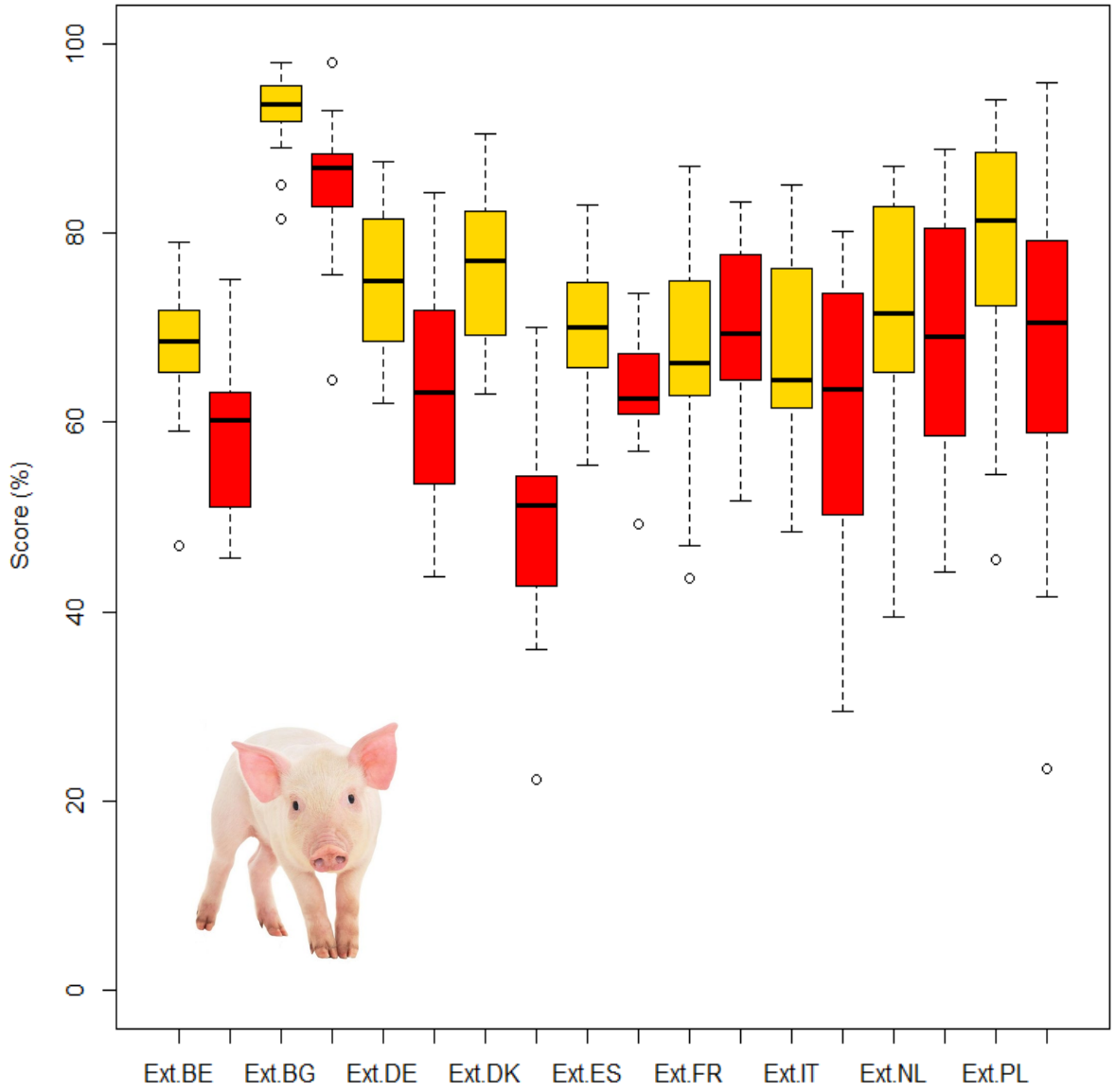
COUNTRY-LEVEL COMPARISON OF EXTERNAL AND INTERNAL BIOSECURITY



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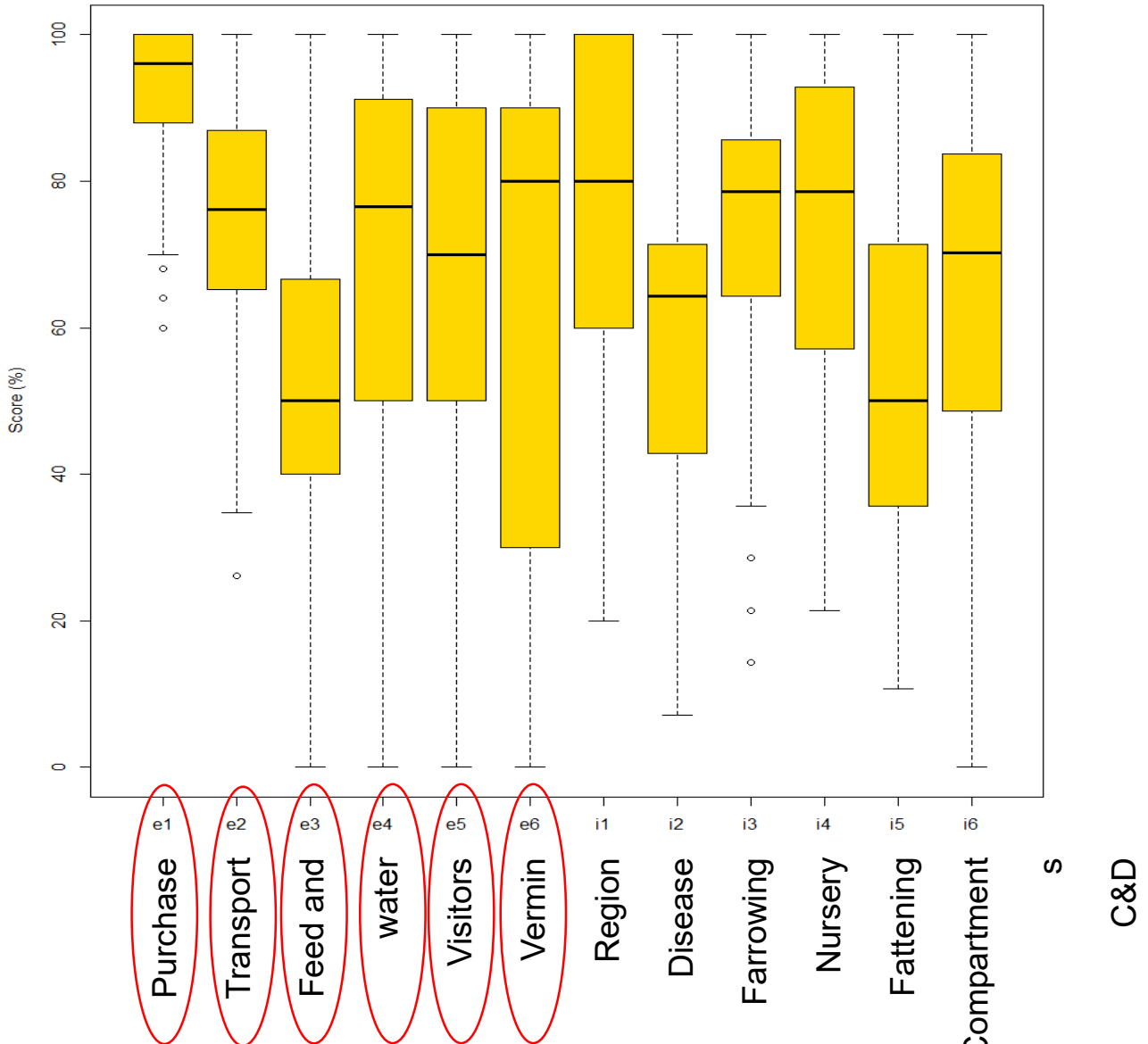
EFFORT
AGAINST ANTIMICROBIAL RESISTANCE

OVERVIEW PER SUBCATEGORY



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EFFORT
AGAINST ANTIMICROBIAL RESISTANCE

Impact of biosecurity

Zoonoses AND PUBLIC HEALTH

Explore this journal >

Original Article

Reducing Antimicrobial Usage in Pig Production without Jeopardizing Production Parameters

M. Postma ✉, W. Vanderhaeghen, S. Sarrazin, D. Maes, J. Dewulf

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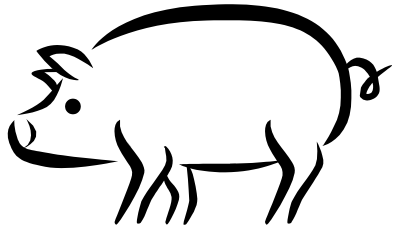

Total biosecurity: + 11,9%

Internal biosecurity: + 18,8%

External biosecurity: + 6,6%

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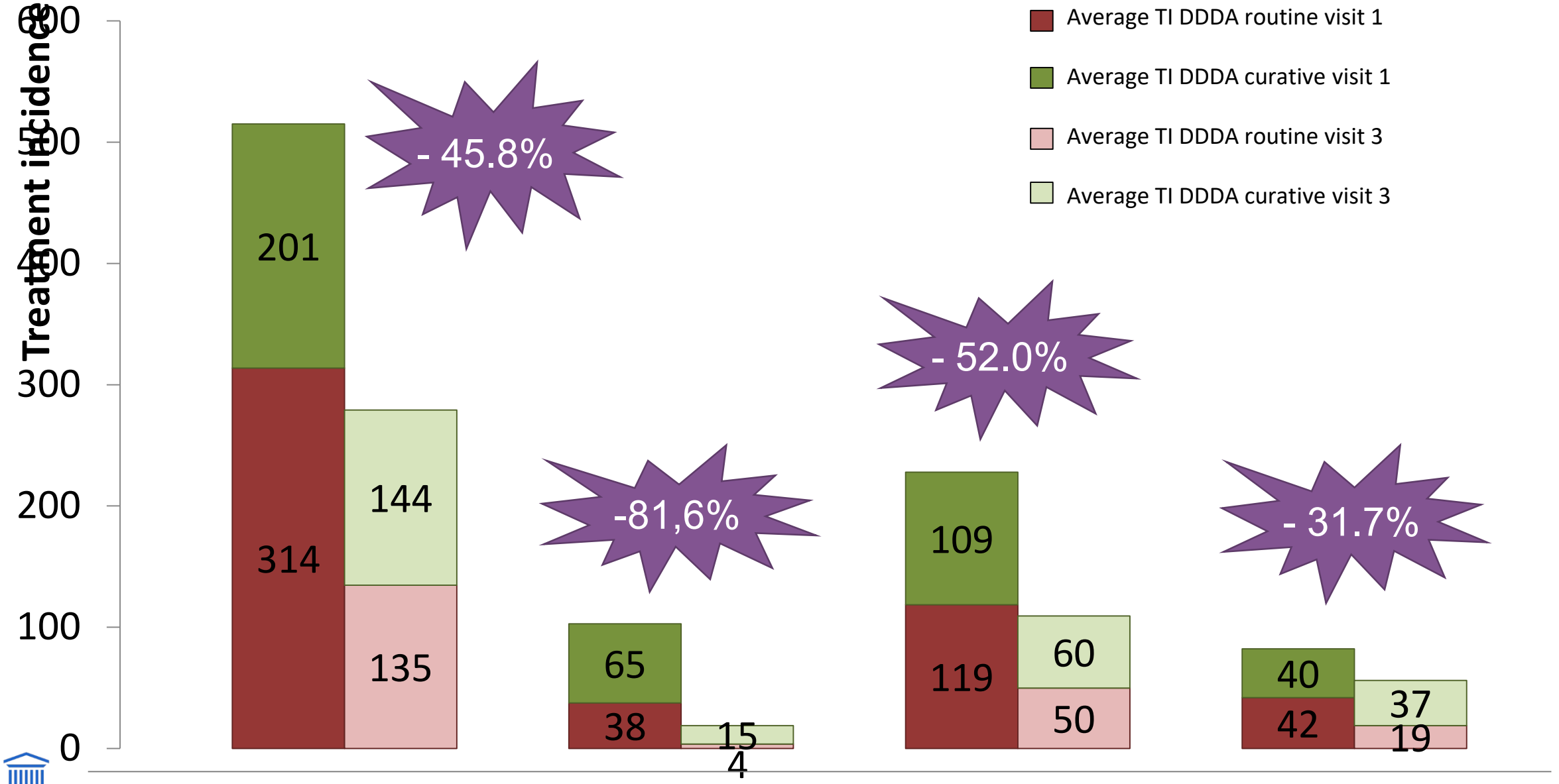

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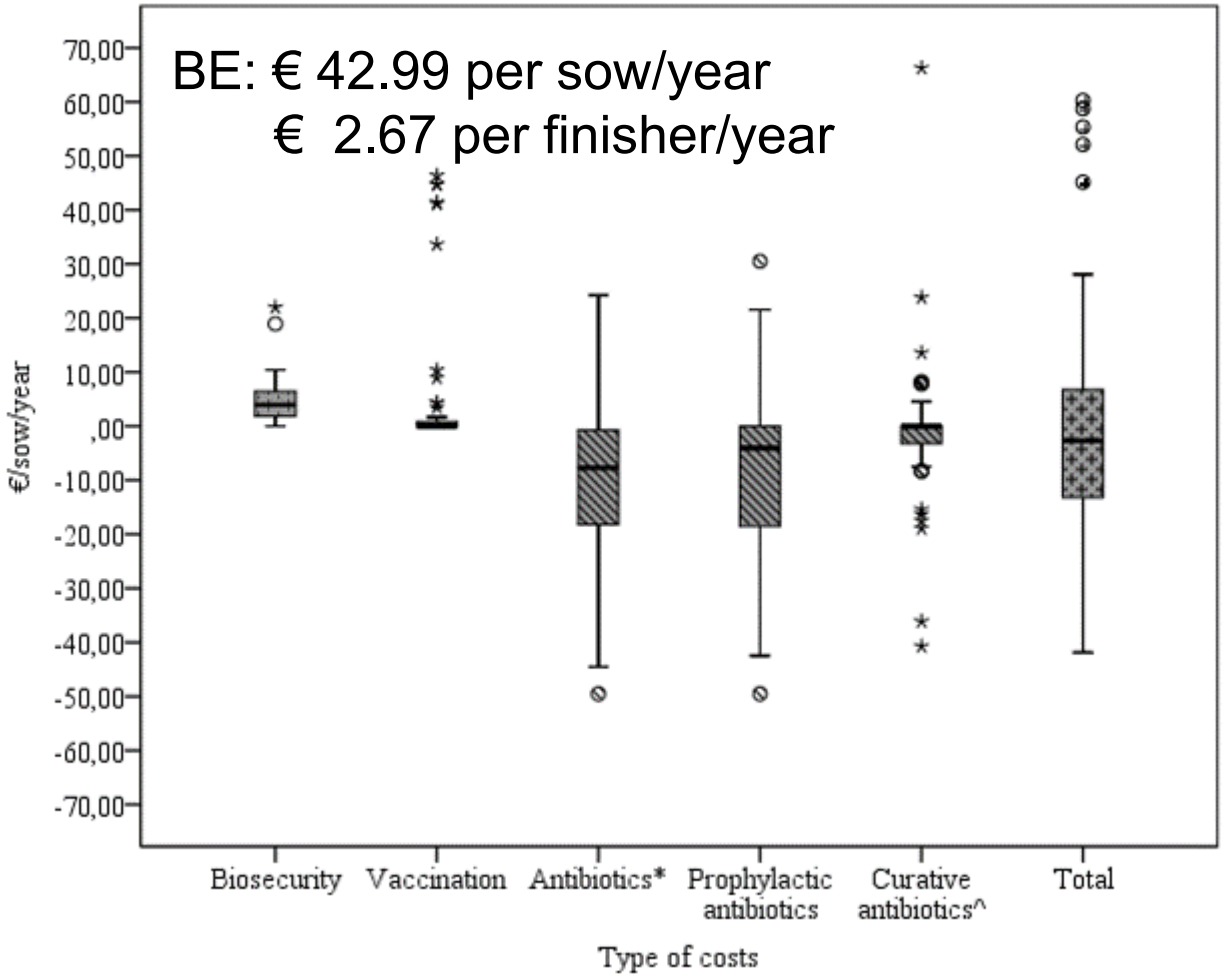
Production results

	VISIT	MEAN	DIFFERENCE	P-VALUE
Weaned piglets per sow per year	Initial	26.4	+1,1	<0.01
	Follow up	27.5		
Daily weight gain	Initial	667.5	+7,7	0.01
	Follow up	675.2		
Mortality in finisher pigs (%)	Initial	3.2	-0,6	0.04
	Follow up	2.6		

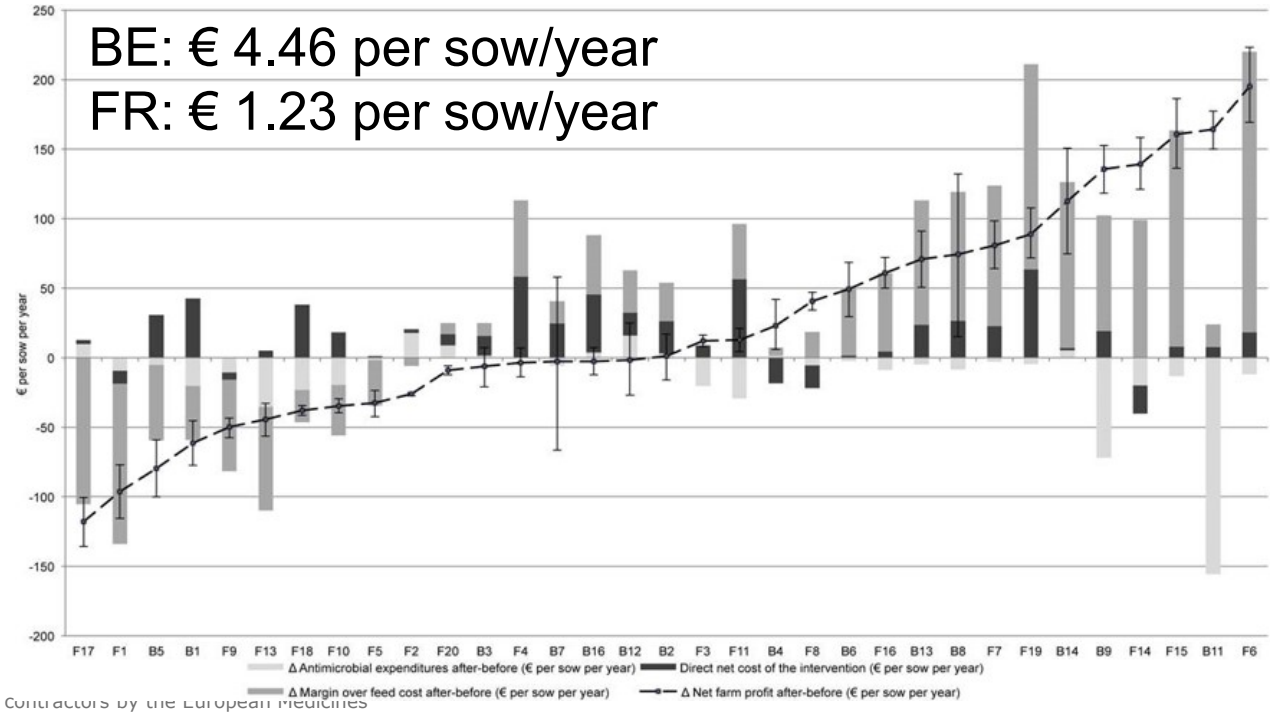
Postma et al, 2017



Preventive Veterinary Medicine 144 (2017) 167–178
Contents lists available at ScienceDirect
Preventive Veterinary Medicine
journal homepage: www.elsevier.com/locate/prevetmed

Herd-specific interventions to reduce antimicrobial usage in pig production without jeopardising technical and economic performance

L. Collineau[a,b,*], C. Rojo-Gimeno[c,d], A. Léger[a], A. Backhans[e], S. Loesken[f], E.Okholm Nielsen[g], M. Postma[d], U. Emanuelson[e], E.grosse Beilage[f], M. Sjölund[e,h], E. Wauters[c], K.D.C Stärk[a], J. Dewulf[d], C. Belloc[b], S. Krebs[b]



Preventive Veterinary Medicine 129 (2016) 74–87
Contents lists available at ScienceDirect
Preventive Veterinary Medicine
journal homepage: www.elsevier.com/locate/prevetmed

Farm-economic analysis of reducing antimicrobial use whilst adopting improved management strategies on farrow-to-finish pig farms

Cristina Rojo-Gimeno[a,b,c,1], Merel Postma[b,1], Jeroen Dewulf[b], Henk Hogeveen[c], Ludwig Lauwers[a,d], Erwin Wauters[a,e]

Conclusion

- Huge amount of data on AMU and AMR
- Increasing amount of data on Biosecurity

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Conclusion

- Challenges:
  - A lot of standardization in data collection and analysis is needed
  - Data ownership and availability needs to be sorted out
  - Open data should become the standard

→ Need to get the DB connected

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“An ounce of prevention, is worth a pound of cure”

- Benjamin Franklin -

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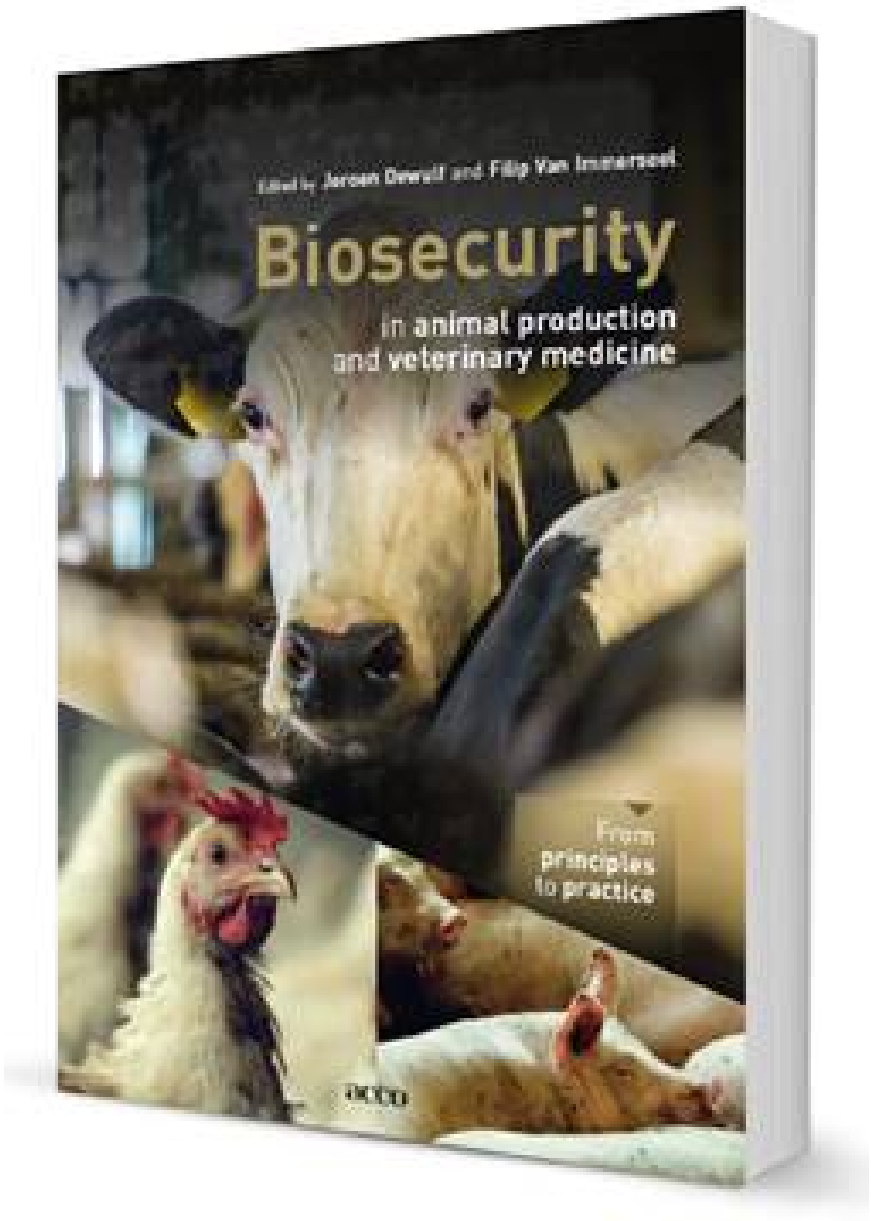

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Jeroen Dewulf
Full Professor

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