Risk Factors Associated with Antimicrobial Use in Italian Poultry Production

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Quantification, Benchmarking and Stewardship of Veterinary Antimicrobial Usage

Bern, Switzerland, 2-3 July 2019

Introduction

- AMU in livestock is a major concern for AMR
- The reduction of AMU in an emerging demand for consumers, becoming an important aspect of food quality
- Poultry industry is a vertically integrated production, with the capacity to develop an action plan on a large scale for reducing AMU

Objectives

- The aims of this research were to provide a qualitative AMU overview during 2015-2017 in broilers and turkeys and to identify possible risk factors

- Farms belonged to one leading integrated Italian poultry industry, which had declared the implementation of a plan containing several actions aiming at the responsible use of antimicrobials

- AMU of 6672 and 1264 fattening cycles of broilers and turkeys for a three-year-period (2015-2017) were provided by the Company and analysed

Materials and Methods

0 kg
.5 months

2-3kg
1-1.5 months

9 kg
3.5 months

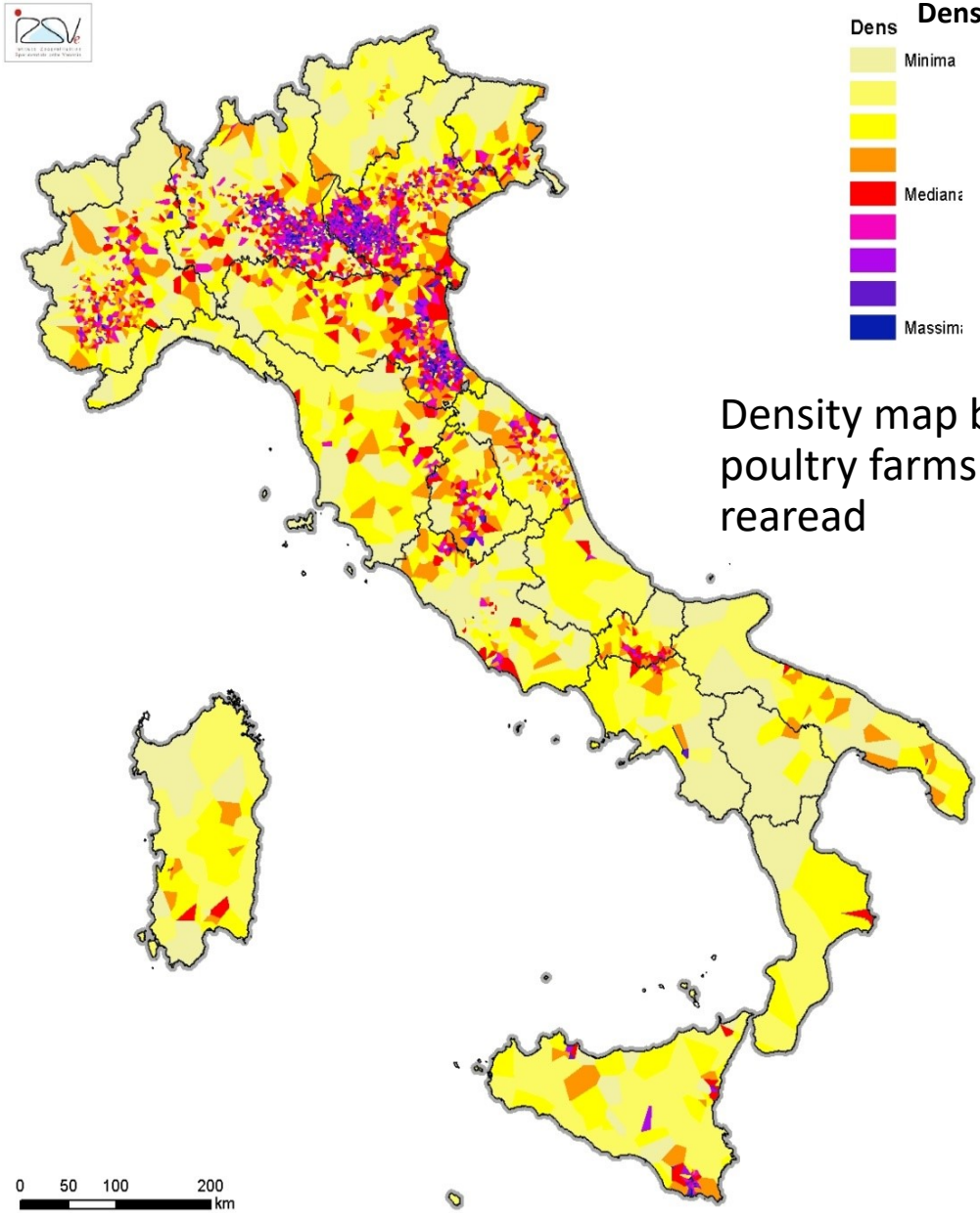
Materials and Methods

- Kilograms of live-weight produced in each cycle and n. slaughtered animals per year were provided

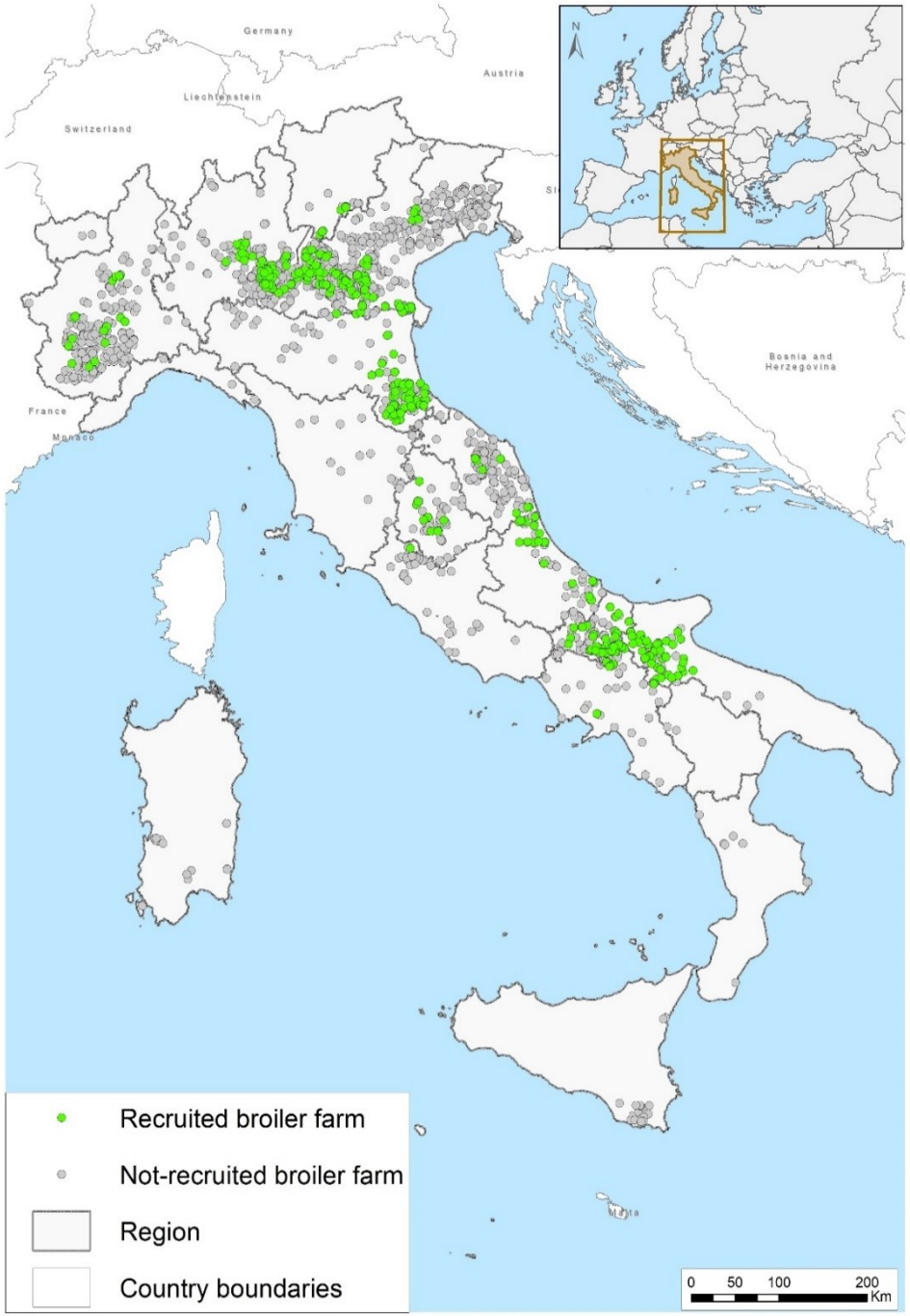
- AMU and usage of HP-CIA were evaluated per each production cycle using DDDita/kg and per year using DDDvet/PCU

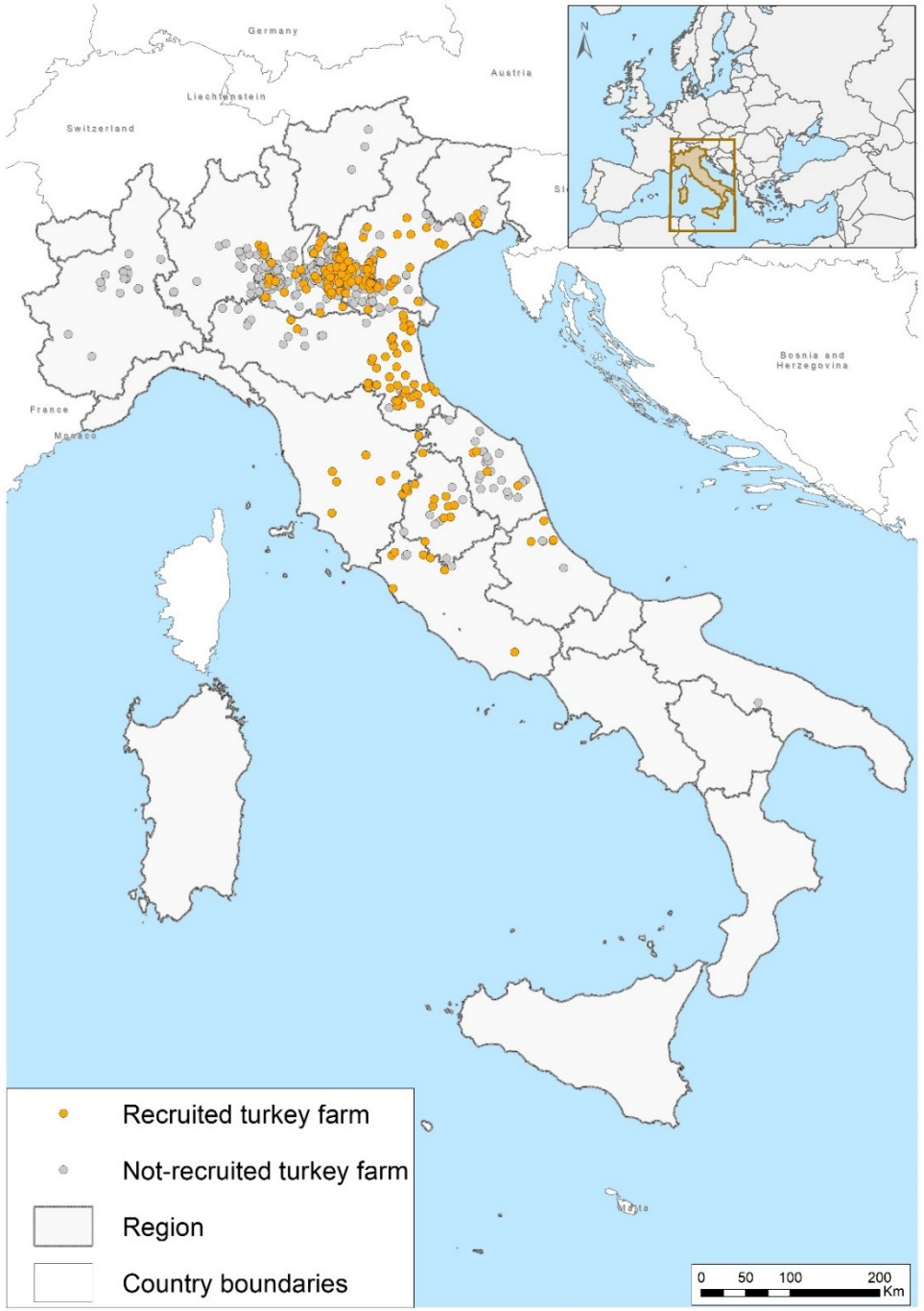
- A linear mixed model was applied to examine the effect of:
    1. Elevation (plain: <300m; or hill/mountain: ≥300m a.s.l.)
    2. Region (Northern, Central or Southern Italy)
    3. Season (broilers only)
    4. Gender (turkey only)
    5. Poultry population density
    6. The prescribing veterinarian

Elevation and poultry density



Density map based on number of poultry farms and n. of animals reared


Germany
Austria
Liechtenstein
Switzerland
Bosnia and Herzegovina
France
Monaco
Malta
N
Recruited broiler farm
Not-recruited broiler farm
Region
Country boundaries
0 50 100 200
Km


Germany
Austria
Liechtenstein
Switzerland
Bosnia and Herzegovina
France
Monaco
Malta
N
Recruited turkey farm
Not-recruited turkey farm
Region
Country boundaries
0 50 100 200
Km

Results

- AMU: -78% in broilers and -57% in turkeys
- HP-CIAs: -95% in broilers and -75% in turkeys

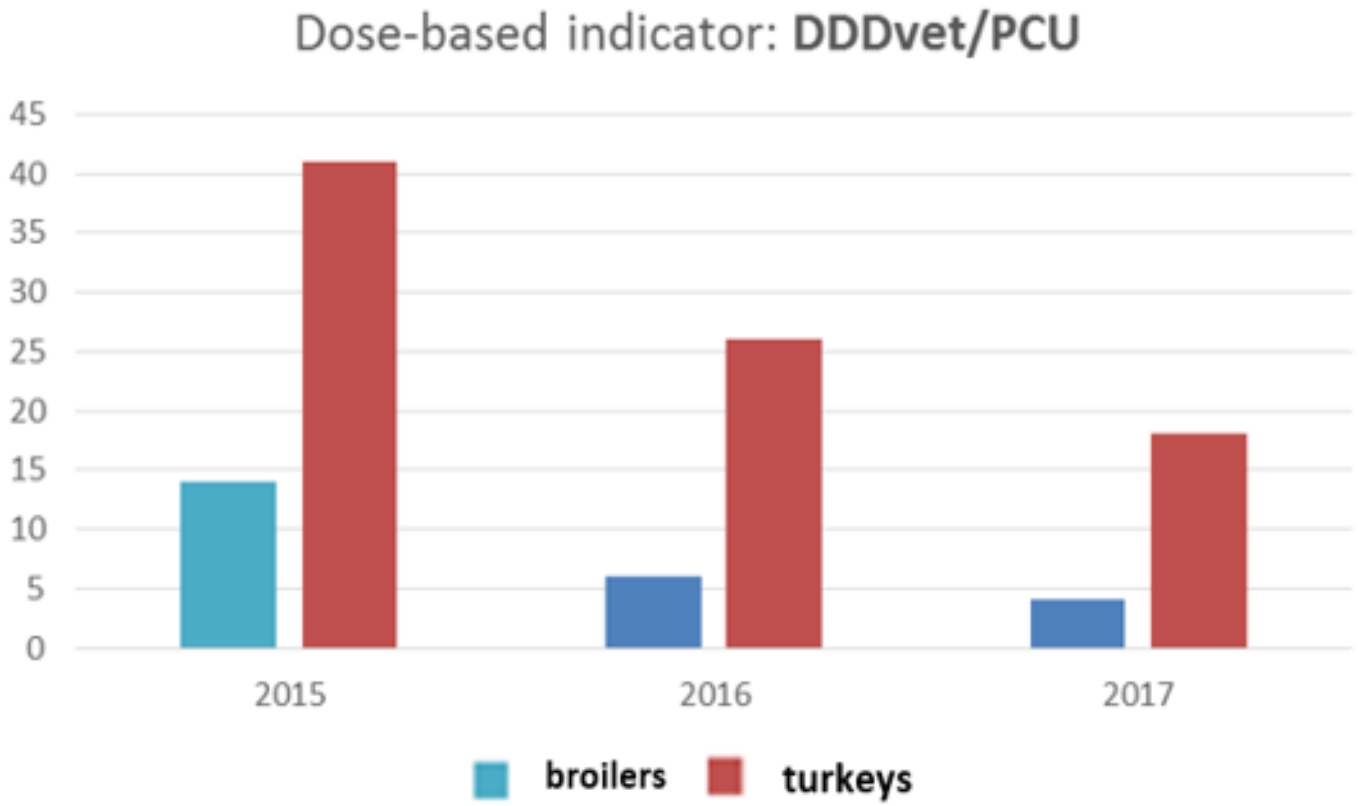


Table 2. Associations between mean DDD_{ita}/kg ± SEM and different variables in 2015–17 in 5827 broiler and 1264 turkey grow-out cycles from 470 and 252 Italian farms, respectively, using linear mixed models

	Broilers			Meat turkeys		
	n	Mean DDD_{ita}/kg ± SEM	*P*	*n*	Mean DDD_{ita}/kg ± SEM	*P*
Year						
2015	1890	5.49 ± 0.13	<0.001	446	17.66 ± 0.43	<0.001
2016	1968	2.45 ± 0.08		423	12.56 ± 0.32	
2017	1969	1.34 ± 0.05		395	9.64 ± 0.32	
Geographical area						
Northern Italy[a]	2819	2.12 ± 0.08	<0.001	728	14.62 ± 0.30	0.019
Central Italy[b]	1502	3.51 ± 0.11		536	11.86 ± 0.35	
Southern Italy[c]	1506	4.37 ± 0.12		0	—	
Elevation						
plain (<300 m a.s.l)	3926	2.63 ± 0.07	0.040	1043	13.96 ± 0.26	0.037
hill/mountain	1901	3.96 ± 0.11		221	11.04 ± 0.47	
Poultry density[d]						
low/medium	920	2.54 ± 0.12	<0.001	424	11.23 ± 0.35	<0.001
high	1823	3.09 ± 0.10		604	14.16 ± 0.32	
very high	3084	3.20 ± 0.08		236	15.61 ± 0.61	
Astronomical season						
autumn	1473	2.12 ± 0.09	<0.001	NA	NA	NA
winter	1351	3.54 ± 0.14				
spring	1481	3.83 ± 0.13				
summer	1522	2.80 ± 0.10				
Gender						
female	NA	NA	NA	431	12.56 ± 0.41	0.063
male/mixed sex				833	13.91 ± 0.27	

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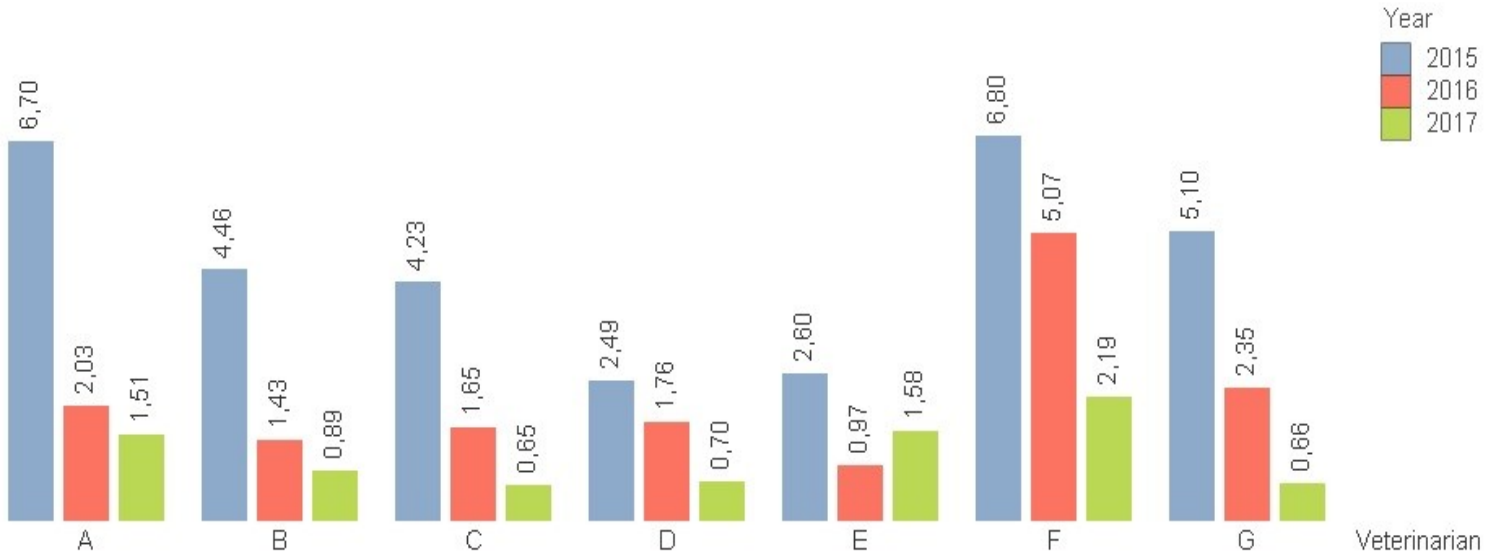
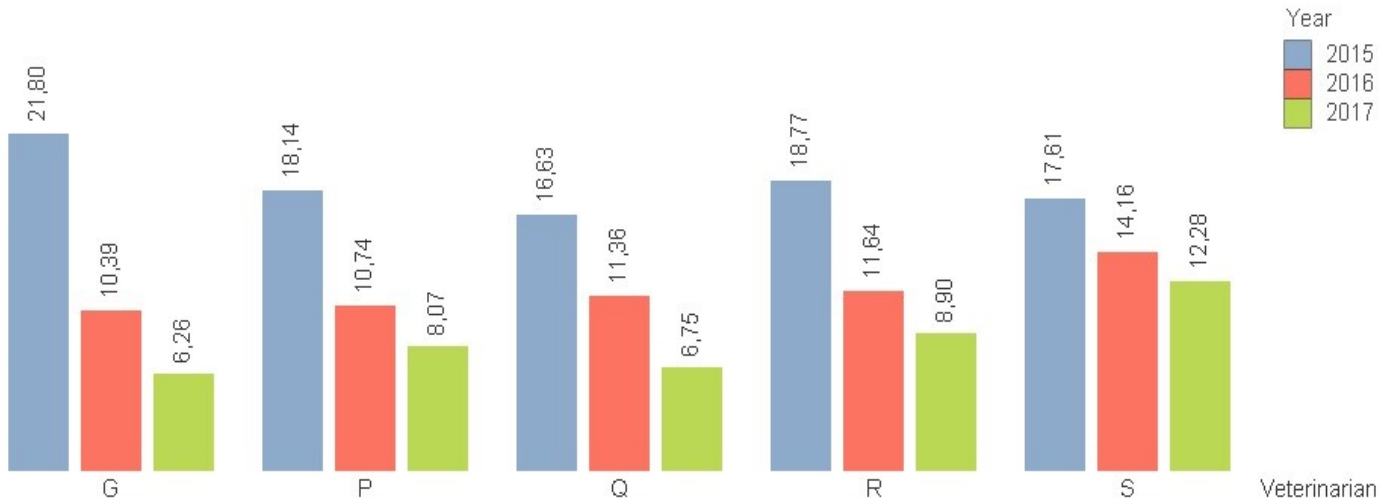
Mean of DDDita/Kg by veterinarian and year, for broilers



Mean of DDDita/Kg by veterinarian and year, for turkeys

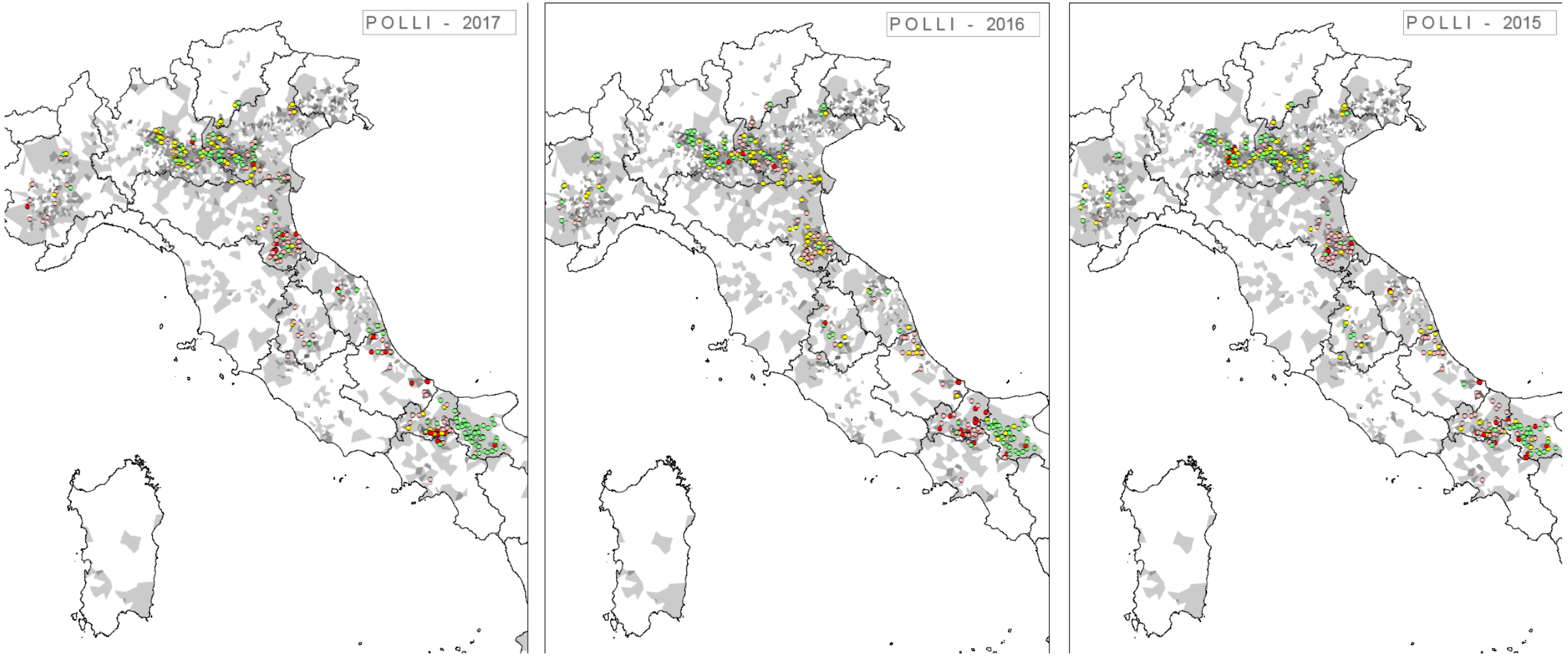


Results

	Year		Northern Italy[1]		Central Italy[2]	Southern Italy[3]	
		Vet_code	B	C	A	F	G
Broilers (DDD_{ita}/kg)	2015	n.	268	531	480	296	158
		Mean± SE	4,46±0,30	4,23±0,28	7,05±0,25	6,80±0,27	6,99±0,48
	2016	n.	290	535	459	345	168
		Mean± SE	1,43±0,12	1,65±0,17	2,19±0,11	5,07±0,23	3,51±0,39
	2017	n.	279	511	461	381	158
		Mean± SE	0,89±0,09	0,65±0,05	1,59±0,08	2,19±0,17	1,86±0,19

			Northern Italy[4]		Central Italy[5]	
		Vet_code	R	S	P	Q
Turkeys (DDD_{ita}/kg)	2015	n.	52	218	72	97
		Mean± SE	18,77±1,26	17,61±0,59	18,14±1,32	16,69±0,84
	2016	n.	47	194	69	106
		Mean± SE	11,64±0,67	14,16±0,52	10,74±0,62	11,39±0,59
	2017	n.	39	175	72	101
		Mean± SE	8,90±0,64	12,28±0,58	8,07±0,51	6,75±0,42

A dashboard to target actions



green: min-25th percentile; **yellow**: 25th percentile-median;
salmon: median-90th percentile; **red**: 90th percentile- max.

The declared action plan

- Relocation of breeder farms in low density areas
- Training farmers regarding health management and animal welfare
- Improvements in ventilation and biosecurity, renewal of farms
- Interventions on drinking water quality
- Infrastructural and managerial interventions implemented at the hatcheries (e.g. strict egg quality checks, ban of formalin, all-in/all-out incubators).
- In 2017, colistin was banned in broilers, and fluoroquinolones have been used only in exceptional cases

Conclusions

A decrement in AMU due to a thorough revision of several management practices was found

The study evidenced some major determinants for drug usage, some intrinsically connected with the type of production, but some others due to management

J Antimicrob Chemother
doi:10.1093/jac/dkz212

Journal of Antimicrobial Chemotherapy

Trends and correlates of antimicrobial use in broiler and turkey farms: a poultry company registry-based study in Italy

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Received 1 March 2019; returned 29 March 2019; revised 10 April 2019; accepted 18 April 2019

Background: Antimicrobial usage (AMU) in livestock plays a key role in the emergence and spread of antimicrobial resistance. Analysis of AMU data in livestock is therefore relevant for both animal and public health.

Objectives: To assess AMU in 470 broiler and 252 turkey farms of one of Italy's largest poultry companies, accounting for around 30% of national poultry production, to identify trends and risk factors for AMU.

Methods: Antimicrobial treatments administered to 5827 broiler and 1264 turkey grow-out cycles in 2015–17 were expressed as DDDs for animals per population correction unit (DDD_{vet}/PCU). A retrospective analysis was conducted to examine the effect of geographical area, season and prescribing veterinarian on AMU. Management and structural interventions implemented by the company were also assessed.

Results: AMU showed a 71% reduction in broilers (from 14 to 4 DDD_{vet}/PCU) and a 56% reduction in turkeys (from 41 to 18 DDD_{vet}/PCU) during the study period. Quinolones, macrolides and polymyxins decreased from 33% to 6% of total AMU in broilers, and from 56% to 32% in turkeys. Broiler cycles during spring and winter showed significantly higher AMU, as well as those in densely populated poultry areas. Different antimicrobial prescribing behaviour was identified among veterinarians.

Conclusions: This study evidenced a decreasing trend in AMU and identified several correlates of AMU in broilers and turkeys. These factors will inform the design of interventions to further reduce AMU and therefore counteract antimicrobial resistance in these poultry sectors.

Thank for your attention

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