

The influence of the antimicrobial use in the resistance data on clinical and non-clinical isolates from broilers and turkeys in Germany

Octavio Mesa-Varona¹, Heike Kaspar², Mirjam Grobbel¹, Bernd-Alois Tenhagen¹

1. Biological Safety Department, German Federal Institute for Risk Assessment (BfR), Berlin, Germany
2. Federal Office of Consumer Protection and Food Safety, Berlin, Germany



Antimicrobial use (AMU) is a main driver of antimicrobial resistance (AMR), one of the major public health concerns in the human and animal sectors. However, it is frequently difficult to demonstrate this association as AMR is also influenced by many factors. Surveillance and monitoring systems on AMU and AMR are essential pillars for global, regional and national strategies against AMR to control and assess the trends.

METHODS

German data on AMR in clinical and non-clinical *E. coli* isolates together with usage data (based on the German unit therapy frequency) in broilers and turkeys were collected from monitoring systems between 2014 and 2017. Resistance had been determined using broth microdilution and interpreting the minimum inhibition concentrations according to the EUCAST epidemiological cut off values. The purpose of this work is to find associations between AMU and AMR. Logistic regression analyses were performed to assess the association between the AMU and the dependent variable (AMR) for the antimicrobial panel overlap between the monitoring systems for clinical and non-clinical isolates (ampicillin, ciprofloxacin, colistin, cefotaxime, gentamicin, nalidixic acid tetracycline).

RESULTS

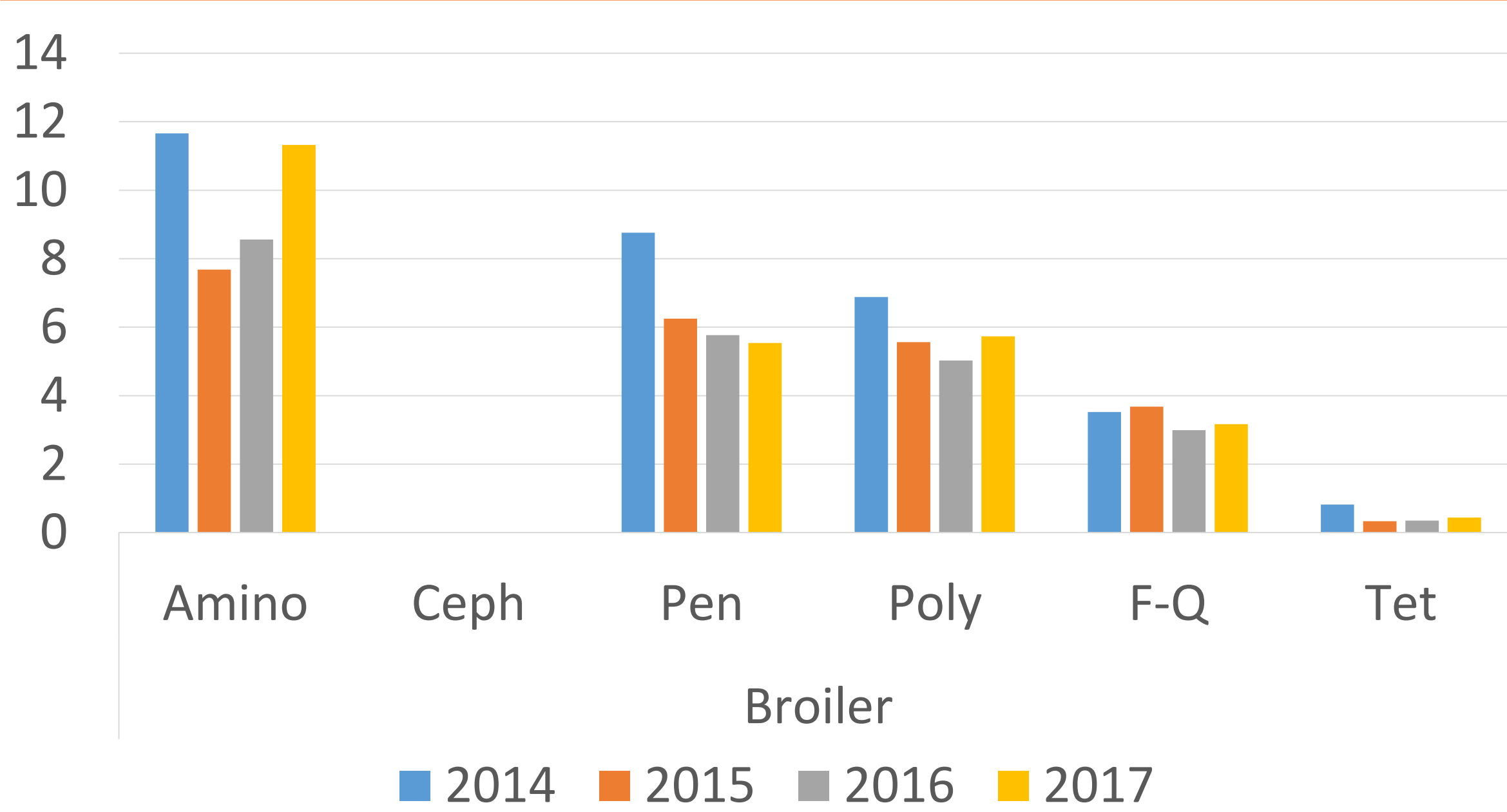


Fig 1. Therapy frequency, an AMU unit applied in Germany, with antimicrobial classes of broilers from 2014 to 2017.

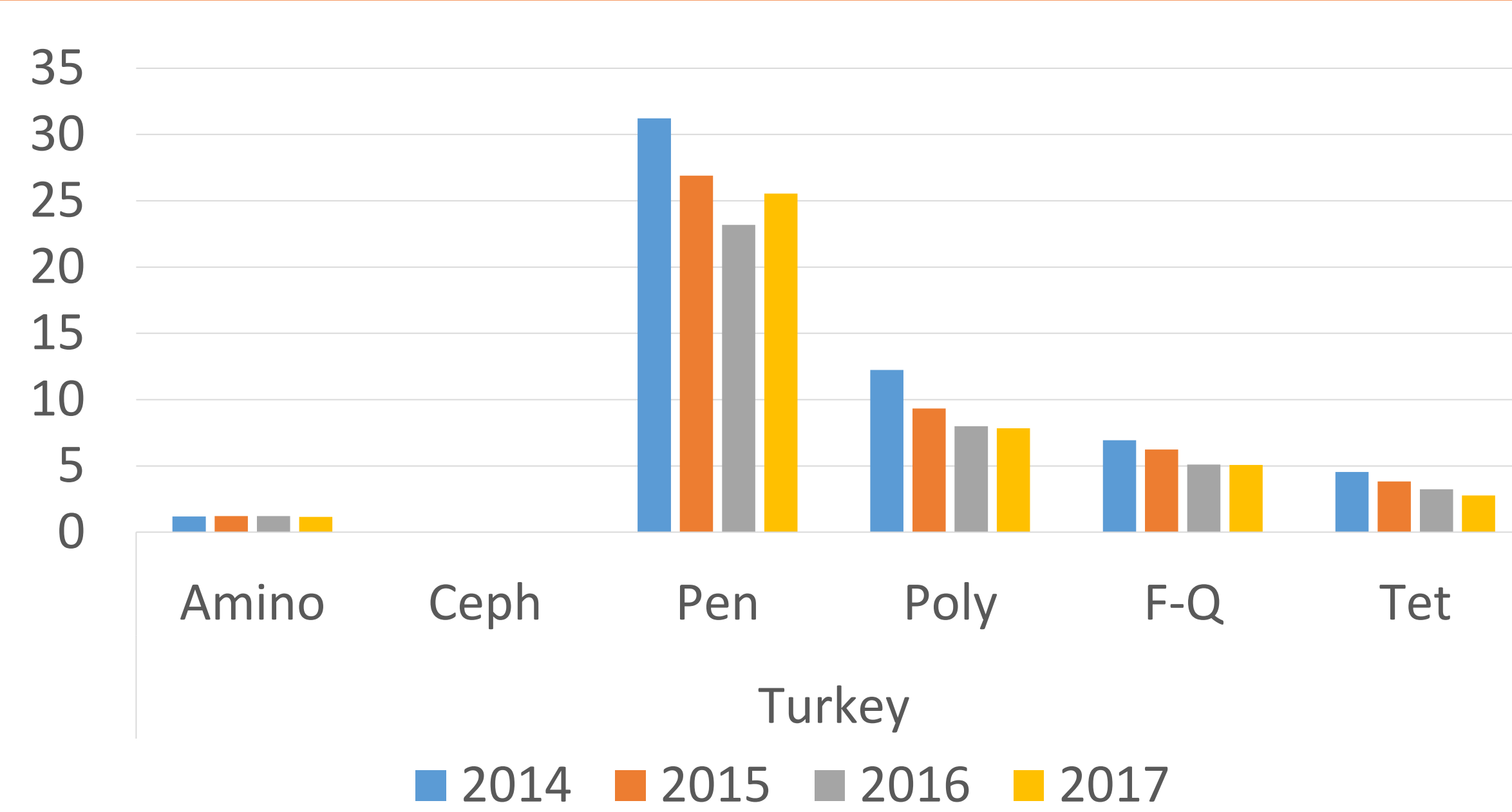


Fig 2. Therapy frequency, an AMU unit applied in Germany, with antimicrobial classes of turkeys from 2014 to 2017.

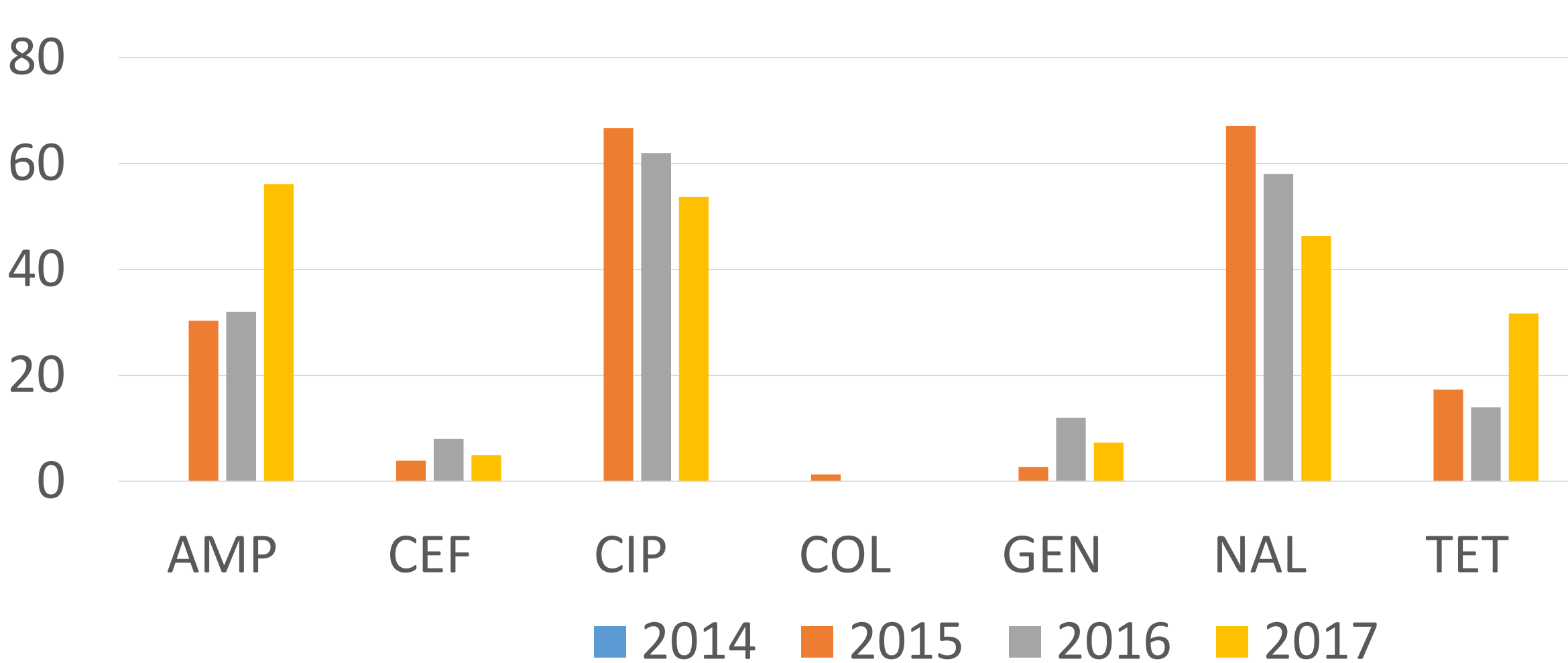


Fig 3. Proportion of resistant isolates of the tested clinical isolates of Escherichia coli reported from broilers in Germany 2014-2017.

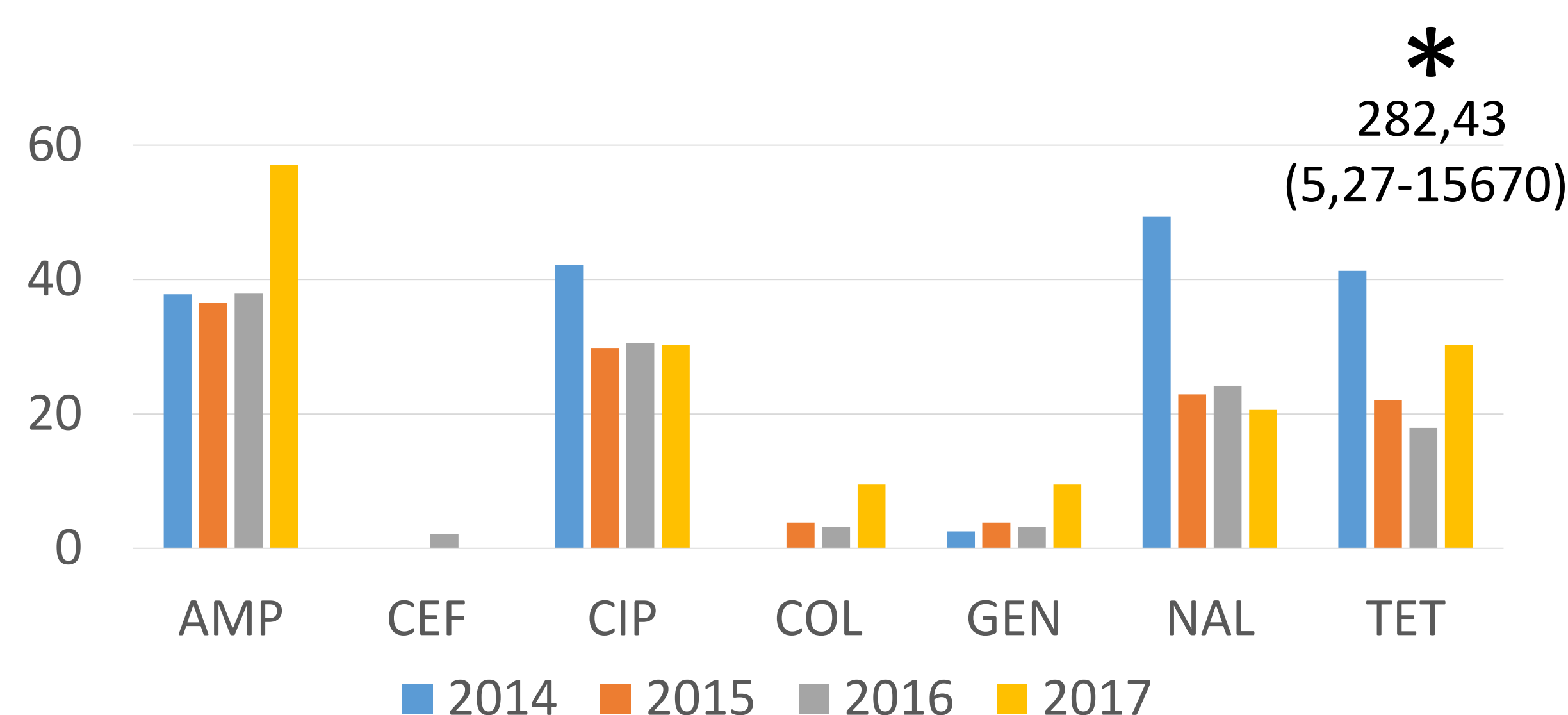


Fig 4. Proportion of resistant isolates of the tested clinical isolates of Escherichia coli reported from turkeys in Germany 2014-2017.

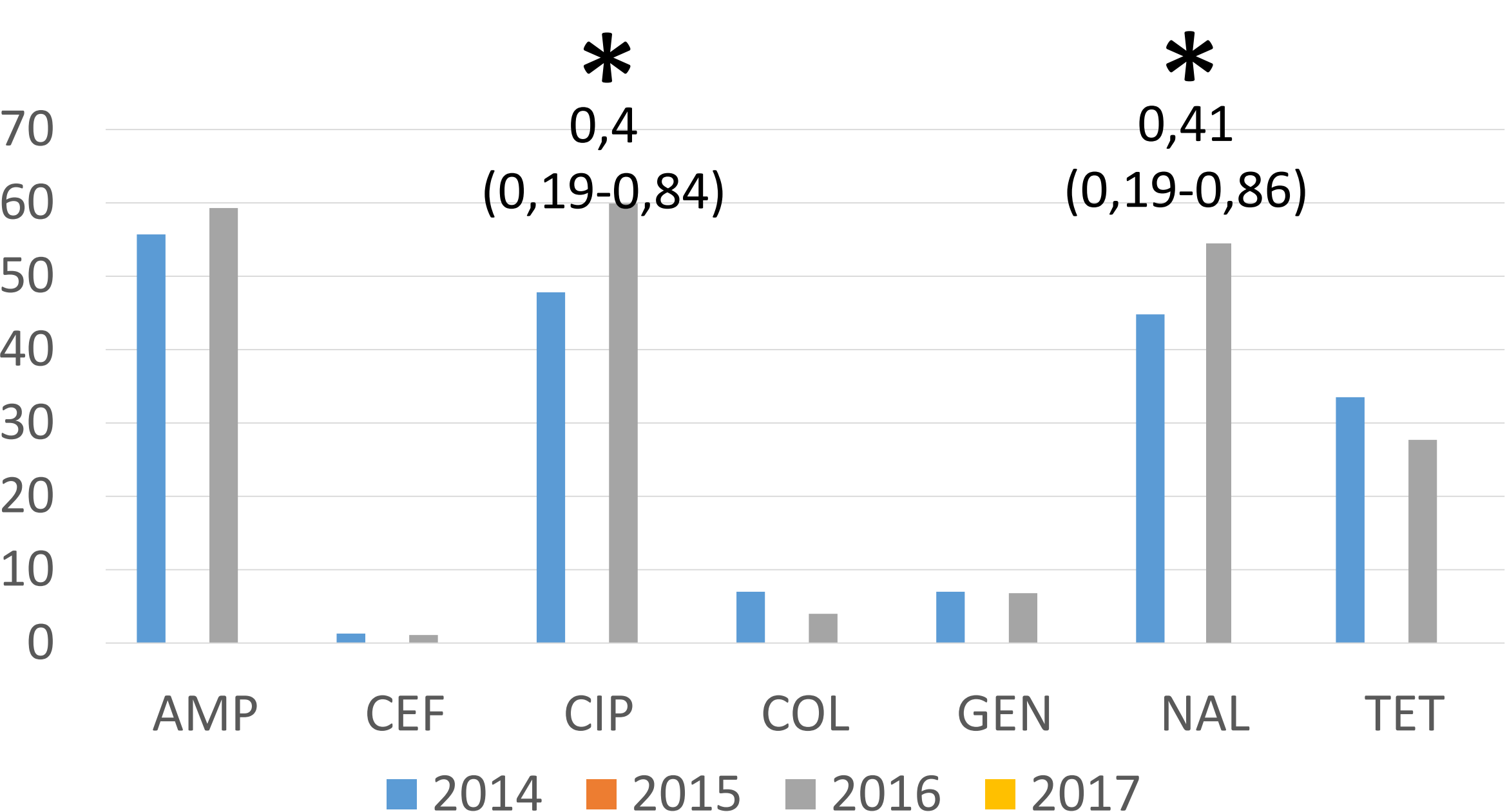


Fig 5. Proportion of resistant isolates of the tested non-clinical isolates of Escherichia coli reported from broilers in Germany 2014-2017.

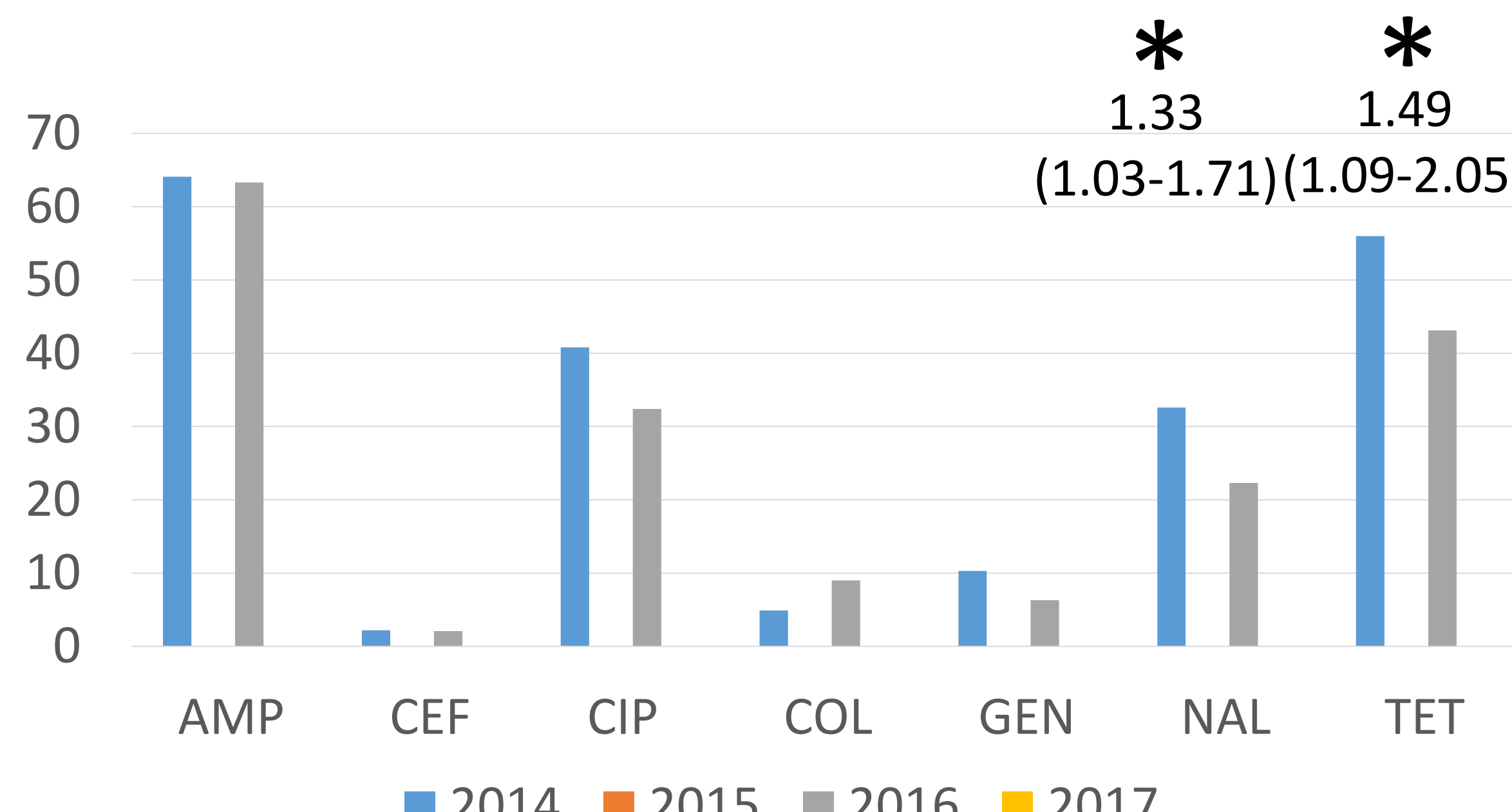


Fig 6. Proportion of resistant isolates of the tested non-clinical isolates of Escherichia coli reported from turkeys in Germany 2014-2017.

Amino: aminoglycosides
Ceph: cephalosporins
Pen: penicillins
Poly: polymixins
F-Q: Fluoroquinolones
Tet: tetracyclines

AMP: ampicillin
CEF: cefotaxime
CIP: ciprofloxacin
COL: colistin
GEN: gentamicin
NAL: nalidixic acid
TET: tetracycline

* Denotes significant association ($p < 0.05$) of resistance to a substance with use of the substance class:
• OR < 1 indicates a negative association
• OR > 1 indicates a positive association
OR: Odd ratio

CONCLUSION AND PERSPECTIVES

- These analyses encounter positive and negative associations of AMU and AMR in isolates from broilers and turkey.
- A negative association between AMU and AMR was shown to ciprofloxacin and nalidixic acid in non-clinical isolates from broilers. In turkeys, positive associations were found to nalidixic acid and tetracycline in non-clinical isolates and to tetracycline in clinical isolates. Further, cefotaxime showed very low levels of resistance in isolates from broilers and turkeys being in line with the null consumption of cephalosporins.
- This study indicates that further data analyses over longer time intervals are required to assess the long-term effects of changes in AMU on the prevalence of AMR.

ACKNOWLEDGEMENTS

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