

A ONE-HEALTH APPROACH TO MONITORING ANTIMICROBIAL CONSUMPTION IN BELGIUM, 2012-2021

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INTRODUCTION

Central to current approaches aimed at tackling antimicrobial resistance (AMR) is the “One Health” concept, emphasizing the need for intersectoral exchanges and cooperation. It is challenging to compare between sectors without common metrics.

Main objective

To compare antimicrobial consumption (AMC) across the human and veterinary sectors using a common measurement (antibiotic consumption (mg) per estimated biomass (kg)).

METHODS

Methodology was based on the JIACRA reports¹, allowing comparison with European averages.

Human Sector

Belgian AMC data for ATC group J01 (antibacterials for systemic use), categorised by sector (community or hospital) were retrieved from the TESSy database². AMC, reported at the substance level (ATC codes, 5th ATC group level), with the route of administration (e.g. oral, parenteral) expressed in defined daily doses (DDD) was converted to mg active product using the latest ATC/DDD index³. To estimate annual human biomass in Belgium, we used population demography data from Eurostat⁴ and estimates of body mass by gender and age from the European Food Safety Agency⁵.

Veterinary Sector

Data on antimicrobial sales in animals, expressed in mg/kg biomass, was collected from the BelVet-SAC reports⁶. This data varies slightly from the JIACRA reported data, as it represents total consumption, compared to the JIACRA inclusion of only food producing species.

Trend analysis

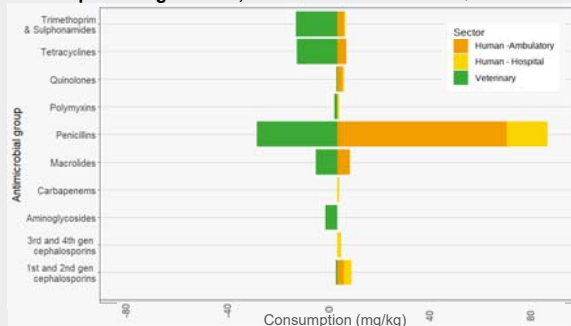
Shapiro-Wilk normality tests and QQ plots were used to check data distribution. Pearson correlation coefficient, Kendall's tau and Spearman's rank correlation tests were performed to assess correlation.

RESULTS

Overall reductions in AMC

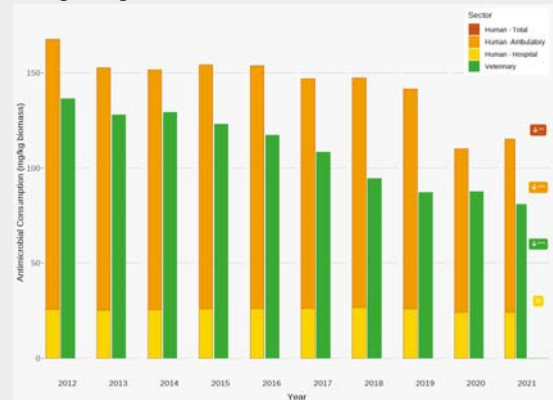
- As observed across Europe, significant reductions in total AMC (mg/kg estimated biomass) were observed in humans and animals
- Consumption in humans and animals correlates within years (Spearman's rank correlation coefficient, $\rho = 0.842$, $p = 0.004$)
- Human consumption consistently higher than veterinary throughout study period (in contrast to the European average, where veterinary consumption was higher until 2016)
- Belgian hospitals accounted for a higher proportion of total human consumption compared to European averages (20.9% in 2021, European average = 10%)
- Reductions in AMC in the human ambulatory sector, with constant hospital consumption → year-on-year increase in the relative contribution of hospitals to total consumption (range = 15.3% in 2012, to 20.9% in 2021).

Comparison of consumption of antimicrobial classes in humans and food-producing animals, 2021. Sources: Human: ESAC-Net⁷, Vet: BelVet-SAC⁸



* Changes in reimbursement criteria in 2018 reduced the proportion of human quinolone consumption that is reimbursable and thus included in our dataset.

Population-weighted mean of total AMC in human and veterinary settings, Belgium, 2012-2021. Sources: Human: ESAC-Net⁷, Vet: BelVet-SAC⁸



Sector-specific consumption patterns (2021)

- Penicillins, first- and second-generation cephalosporins and macrolides → highest selling classes in human medicine when measured in mg/kg estimated biomass, in line with European averages.
- In hospitals, there is a significant proportion of penicillins and first- and second-generation cephalosporins use, but minimal use of macrolides
- Almost all carbapenems, 3rd and 4th generation cephalosporins, and human polymyxin consumption occur in hospitals.
- Penicillins, trimethoprim and sulphonamides molecules, and tetracyclines were the highest selling classes in veterinary medicine.
- Human > Veterinary AMC: penicillins, cephalosporins (all generations) and quinolones
- Veterinary > Human: aminoglycosides, macrolides, polymyxins, tetracyclines, trimethoprim & sulphonamides

CONCLUSION

- Common metrics allow direct intersectoral comparisons
- Significant AMC reductions observed in the veterinary and human ambulatory sectors
- Human hospital sector is more recalcitrant to efforts to reduce AMC
- Unlike in Europe, Belgium has historically had higher consumption in the human sector

REFERENCES

- <https://www.ema.europa.eu/en/veterinary-regulatory-overview/antimicrobial-resistance-veterinary-medicine/analysis-antimicrobial-consumption-resistance-jiacra-reports>
- https://www.ecdc.europa.eu/en/publications-data/european-surveillance-system-nessy_accessed_August_2023
- http://www.whooc.no/atc_ddd_index
- https://ec.europa.eu/eurostat/cache/metadata/en/demo_pop_esms.html
- Guidance on selected default values to be used by the EFSA Scientific Committee, Scientific Panels and Units in the absence of actual measured data [(16)] (<https://www.efsa.europa.eu/en/efsajournal/pub/2579>)
- <https://belvetsac.ugent.be/>
- <https://www.ecdc.europa.eu/en/about-us/partnerships-and-networks/disease-and-laboratory-networks/esac-net>



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