

## Summary of Latest European Data on Antibiotic Resistance and Antibiotic Use

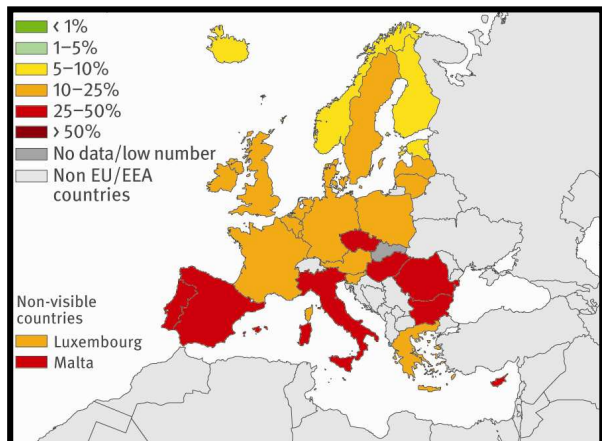
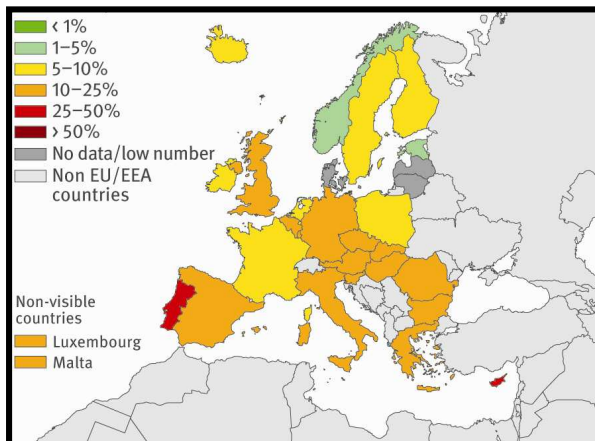
### Highlights on antibiotic resistance

- Antibiotic resistance constitutes an increasingly important human health hazard in Europe.
- The rates of antibiotic resistance and the use of antibiotics show wide variations among European countries.
- *Escherichia coli* (*E. coli*), the most common cause of bacteraemia by gram-negative bacteria and of urinary tract infections, showed a Europe-wide increase of resistance to all antibiotic classes under surveillance.
- Multi-drug resistance (resistance to multiple antibiotics), frequently observed in some bacteria such as *E. coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*, further increases the threat posed by antibiotic resistance as it reduces the available treatment options.
- A decrease of the proportion of methicillin-resistant *Staphylococcus aureus* (MRSA) was reported by some countries, although the MRSA proportions remain above 25% in one third of the countries.
- International cooperation as well as concerted, multi-disciplinary efforts are needed in order to contain and prevent the spread of antibiotic resistance.

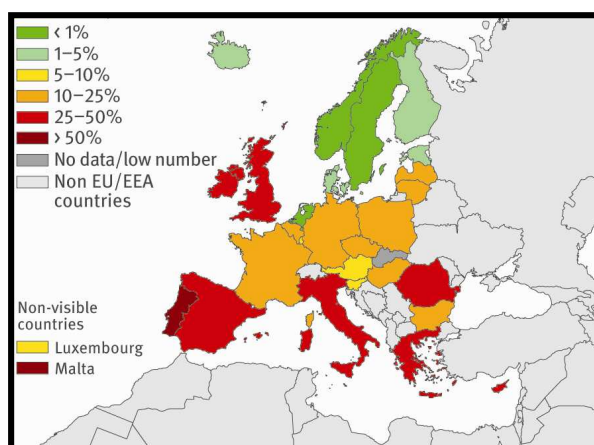
### Antibiotic resistance in Europe

The data presented in this section were collected by the European Antimicrobial Resistance Surveillance System (EARSS) which is contracted by the European Centre for Disease Prevention and Control (ECDC), and funded by the European Union (EU), the Dutch Ministry of Health, Welfare and Sports and the Dutch National Institute of Public Health and the Environment (RIVM). The maps that follow show the country specific proportion of resistant bacteria causing invasive infections and are based on laboratories' results from the EU and European Economic Area (EEA) countries. The country colours range from green to dark red according to the frequency of resistance.

*E. coli* is the most frequent cause of bacteraemia by gram-negative bacteria, as well as community and hospital-acquired urinary tract infections. The Europe-wide increase of resistance in *E. coli* to all antibiotic classes under surveillance is continuing and the speed by which important antibiotics like fluoroquinolones are losing their activity against *E. coli* is alarming. This trend is highlighted by the shift towards red which is evident comparing the maps of 2003 and 2008 (Fig. 1a and 1b).



*Staphylococcus aureus*, in its methicillin-resistant form (MRSA), is the most important cause of antibiotic-resistant healthcare-associated infections worldwide. In 2008, more countries showed decreasing MRSA proportions, thus the MRSA problem seems to have stabilised, or even decreased for most countries. Nevertheless, MRSA proportions are still above 25% in one third of countries (Fig. 2).



*Pseudomonas aeruginosa* (*P. aeruginosa*) is an important cause of infection among patients with localised and systemic immune defects. Resistance to carbapenems in *P. aeruginosa* are high all over Europe, as almost three quarters of the countries (23 of 32) reported more than 10% carbapenem resistance (Fig. 3). In Europe, multi-drug resistance is the dominant threat posed by invasive *P. aeruginosa*.

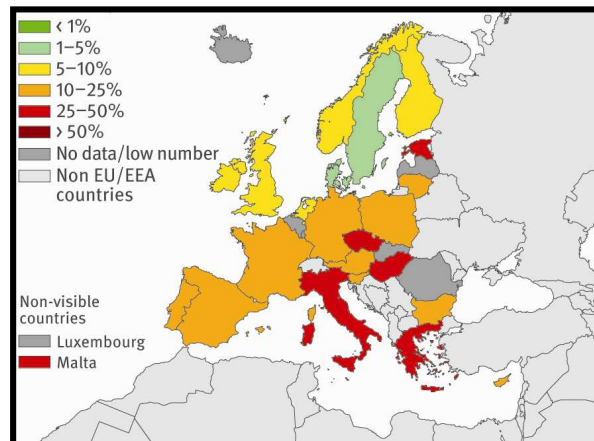


Figure 3) Proportion of carbapenem-resistant *Pseudomonas aeruginosa* in EU/EEA countries in 2008 (“low number” = less than 10 isolates reported)  
Data source: EARSS

*Klebsiella pneumoniae* (*K. pneumoniae*) is an important cause of urinary and respiratory tract infections, especially in individuals with impaired immune systems, such as people with diabetes and hospitalised patients with invasive devices, such as urinary catheters and drips. With regard to *K. pneumoniae*, a high frequency of resistance to 3<sup>rd</sup> generation cephalosporins (Fig. 4), fluoroquinolones and aminoglycosides is evident in Central and South-eastern Europe. Many of these strains, including the most frequent one, show resistance to all the above mentioned antibiotic classes.

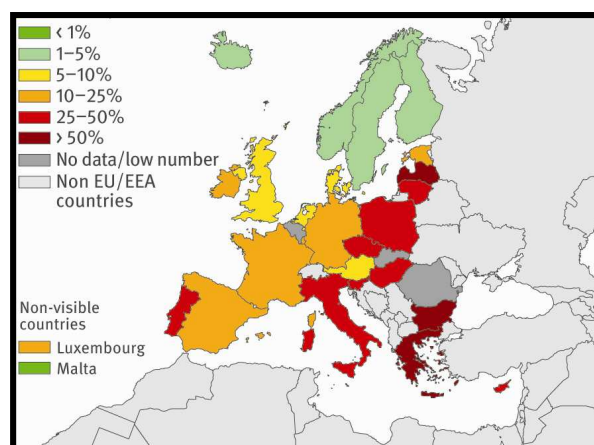


Figure 4) Proportion of 3<sup>rd</sup> generation cephalosporin-resistant *Klebsiella pneumoniae* in EU/EEA countries in 2008 (“low number” = less than 10 isolates reported)  
Data source: EARSS

### Antibiotic use in Europe

The current available data on antibiotic use in the EU/EEA Member States, which are presented below (Fig. 5), were collected by the European Surveillance of Antimicrobial Consumption (ESAC) project, coordinated by the University of Antwerp (Belgium). ESAC is funded by the European Centre for Disease Prevention and Control (ECDC).

The figure shows antibiotic use measured in Defined Daily Doses (DDD) per 1000 inhabitants and per day. Each bar refers to a specific country while the colours show the recorded volume of use of the different antibiotic classes used in that country. The reported data mainly refer to antibiotic use outside hospitals (outpatient use) which accounts for the largest proportion of human consumption. However, comparison of data between countries should be interpreted with caution as some countries report hospital use and outpatient use together. The total outpatient antibiotic use ranged from 11.0 DDD per 1000 inhabitants and per day in The Netherlands to 28.6 DDD per 1000 inhabitants and per day in France.

Penicillins were the most frequently prescribed antibiotic class in all countries, whereas the proportion of use of other antibiotic classes varied among the countries.

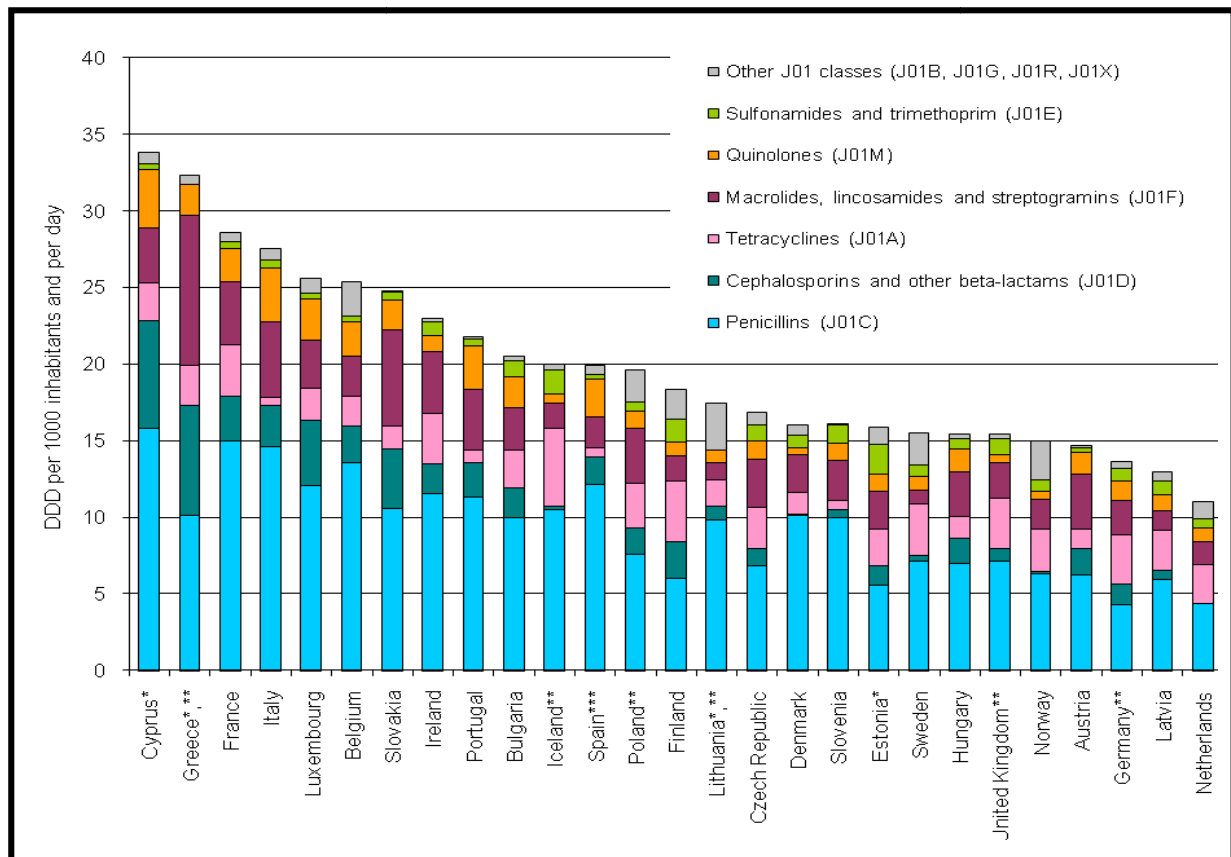


Figure 5) Total outpatient antibiotic use in EU/EEA countries

\*Total use, i.e. including inpatients, for Cyprus, Estonia, Greece and Lithuania.

\*\*2006 data for Germany, Greece, Iceland and Lithuania; 2005 data for Poland and United Kingdom.

\*\*\*Reimbursement data, which do not include over-the-counter sales without prescription.

Data source: ESAC 2007.