



Summary of the latest data on antibiotic resistance in the European Union

November 2013

Highlights on antibiotic resistance

- Antibiotic resistance is a serious threat to public health in Europe, leading to increasing healthcare costs, prolonged hospital stays, treatment failures, and sometimes death.
- Over the last four years (2009 to 2012), resistance to third-generation cephalosporins in *K. pneumoniae* and *E. coli* increased significantly at EU/EEA level. Combined resistance to third-generation cephalosporins and two other important antimicrobial groups (fluoroquinolones and aminoglycosides) also increased significantly at EU/EEA level for *K. pneumoniae*, but not for *E. coli*.
- The increasing trend of combined resistance in *K. pneumoniae* means that only a few therapeutic options (e.g., carbapenems) remain available for treatment of infected patients.
- Carbapenems form a major last-line class of antibiotics to treat infections with multidrug-resistant Gram-negative bacteria such as *K. pneumoniae* and *E. coli*, both common causes of pneumonia, urinary tract infections and bloodstream infections. However, the percentage of carbapenem-resistant *K. pneumoniae* is already high and increasing in some countries in the EU.
- Antimicrobial resistance data for *Acinetobacter* spp. are available in EARS-Net for the first time. Data for 2012 show large inter-country variations in Europe, and high levels of resistance (>25%) to carbapenems in nearly half of the reporting countries.
- In contrast, in the past few years, the percentage of methicillin-resistant *Staphylococcus aureus* (MRSA) has shown a significant decreasing trend at EU/EEA level, and either a continuous decrease or a stabilising trend was observed in most EU/EEA countries during the last four years. Nevertheless, MRSA remains above 25% in almost one fourth of the reporting countries, mainly in southern and eastern Europe.
- Prudent antibiotic use and comprehensive infection control strategies targeting all healthcare sectors (acute care hospitals, long-term care facilities and ambulatory care) are the cornerstones of effective interventions that aim to prevent selection and transmission of antibiotic-resistant bacteria.

Antibiotic resistance in the European Union

The data presented in this section were collected by the European Antimicrobial Surveillance Network (EARS-Net) which is coordinated by ECDC. EARS-Net collects data on invasive bacterial isolates from 30 EU/EEA countries. For more details on EARS-Net, surveillance results and information on analysis methods please refer to the EARS-Net Annual Report 2012 and the EARS-Net interactive database*.

Klebsiella pneumoniae

Klebsiella pneumoniae is a common cause of infections in the urinary tract, respiratory tract and bloodstream. It can spread rapidly between patients in healthcare settings and is a frequent cause of hospital outbreaks.

Antibiotic resistance in *K. pneumoniae* is a public health concern of increasing importance in Europe. A majority of the isolates reported to EARS-Net in 2012 was resistant to at least one of the antimicrobial agents under surveillance, and resistance to multiple antibiotics was common.

In recent years, resistance to third-generation cephalosporins has increased significantly at EU/EEA level as well as in several individual countries. Resistance to third-generation cephalosporins was often combined with resistance to fluoroquinolones and aminoglycosides, further complicating treatment of infections caused by *K. pneumoniae*. This type of combined resistance (third-generation cephalosporins, fluoroquinolones and aminoglycosides) increased significantly during the last four years in the EU/EEA (population-weighted mean) as well as in more than one third of the reporting countries (Figure 1). This increasing trend of combined resistance means that for patients who are infected with these multidrug-resistant bacteria, only a few therapeutic options remain available, among these the carbapenems, a last-line class of antibiotics.

However, resistance to carbapenems has already increased in some countries. In 2012, the percentage of carbapenem resistance in *K. pneumoniae* was above 5% in five countries, most of these in the south of Europe (Figure 2).

* EARS-Net database: http://www.ecdc.europa.eu/en/healthtopics/antimicrobial_resistance/database/Pages/database.aspx

Figure 1. *Klebsiella pneumoniae*: percentage of invasive isolates with combined resistance to third-generation cephalosporins, fluoroquinolones and aminoglycosides, EU/EEA, 2009 (top) and 2012 (bottom)

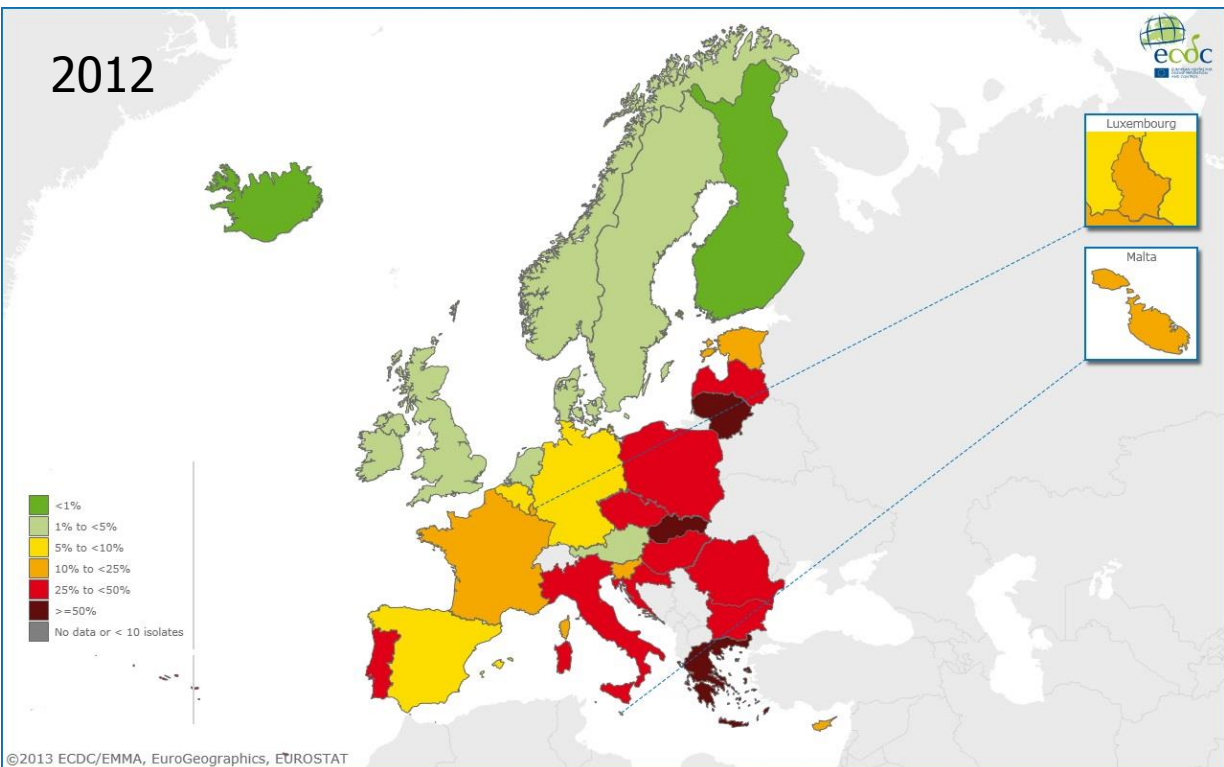
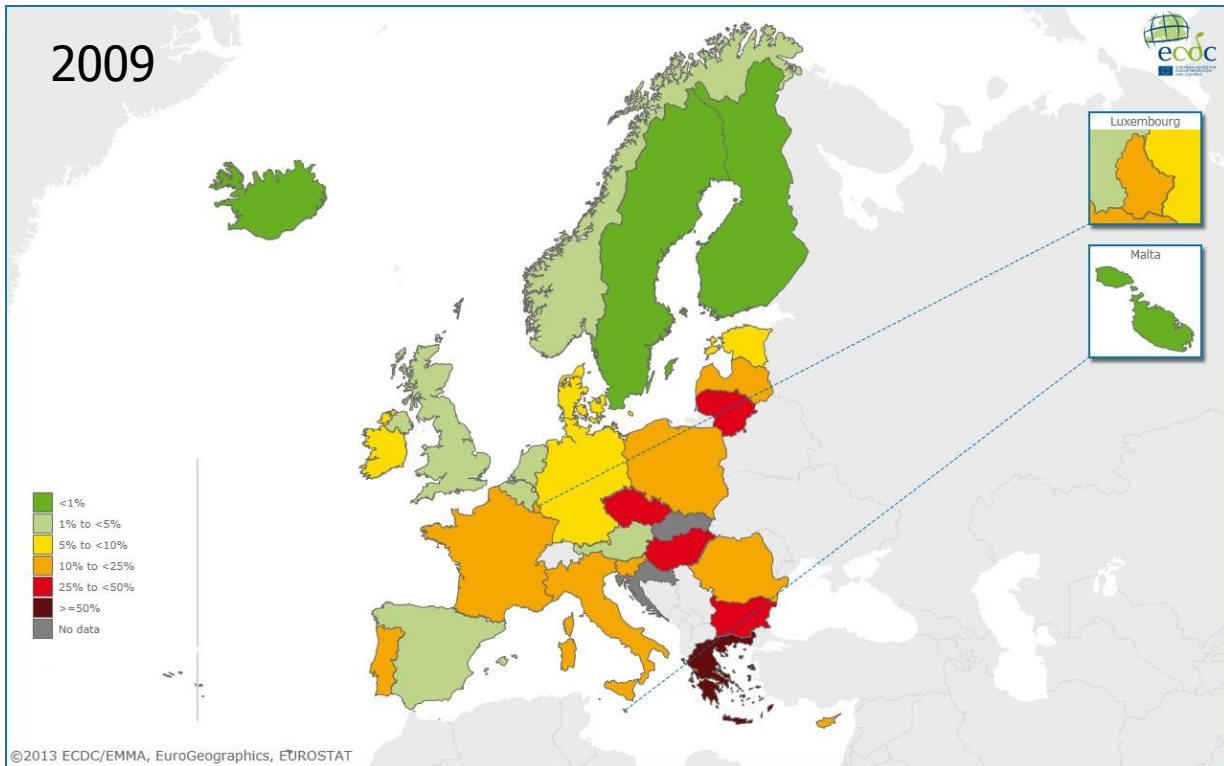
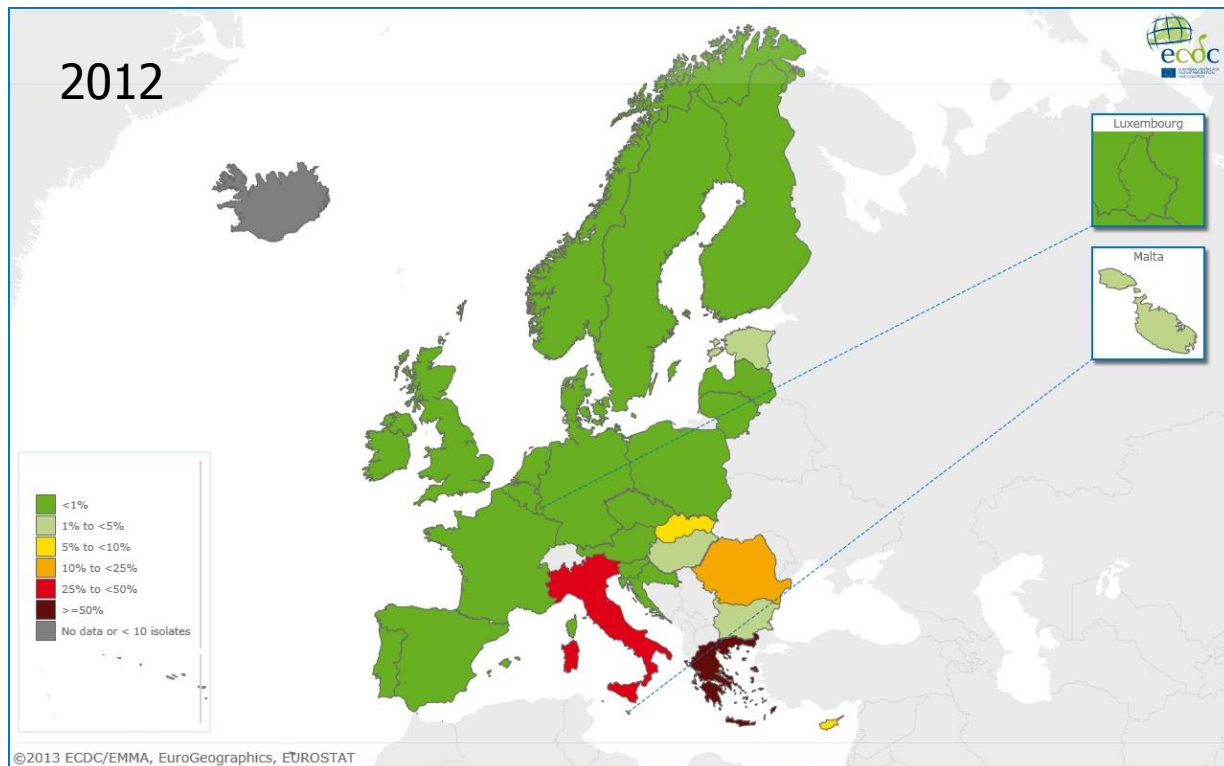
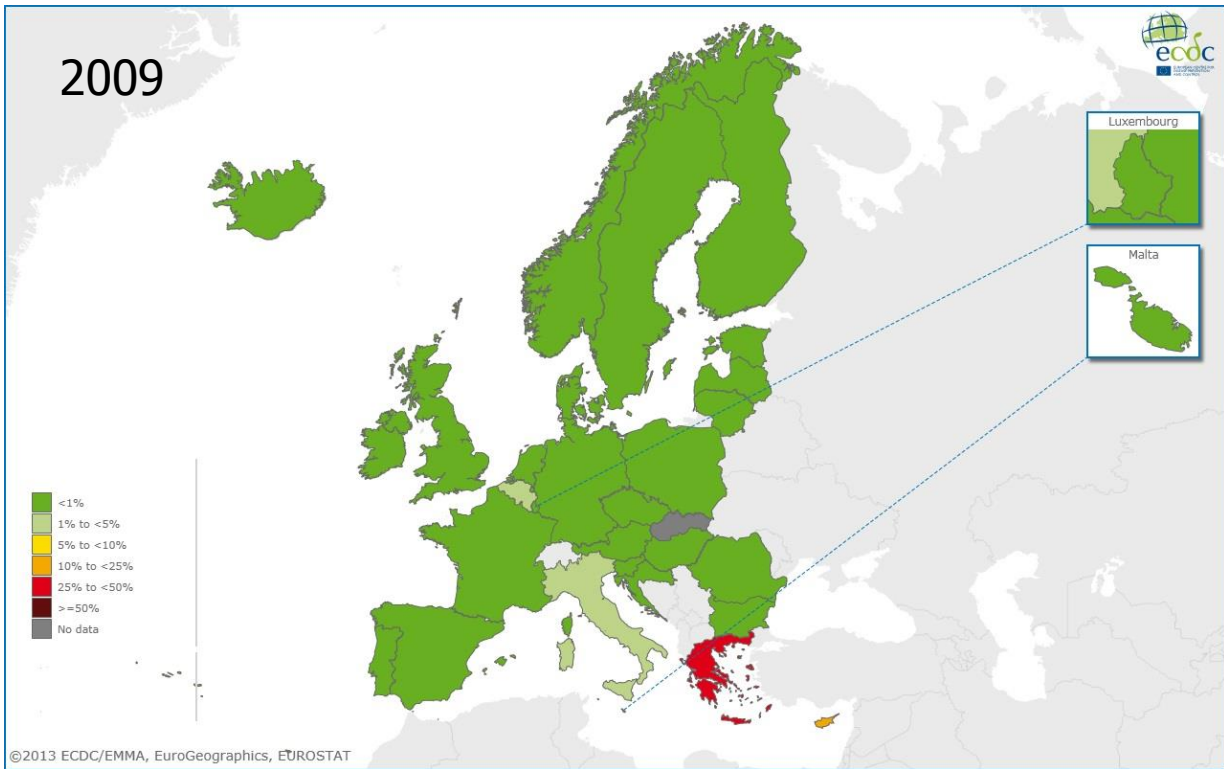


Figure 2. *Klebsiella pneumoniae*: percentage of invasive isolates with resistance to carbapenems, EU/EEA, 2009 (top) and 2012 (bottom)



Escherichia coli

Escherichia coli is the most frequent cause of bloodstream and community- and hospital-acquired urinary tract infections reported worldwide. Furthermore, it is one of the most common food-borne pathogens worldwide.

Antimicrobial resistance in *E. coli* requires close attention as the percentages of isolates resistant to commonly used antimicrobials continue to increase throughout Europe. A majority of the isolates reported to EARS-Net in 2012 was resistant to at least one antibiotic under surveillance.

Of special concern are the increase of resistance to third-generation cephalosporins (Figure 3) and combined resistance to third-generation cephalosporins, fluoroquinolones and aminoglycosides (Figure 4). Several countries had significant increasing trends for these types of resistance during the period 2009–2012. The trend for the population-weighted EU/EEA mean percentage for resistance to third-generation cephalosporins increased significantly from 8.2% in 2009 to 11.8% in 2012, while there was no significant trend for the percentage of combined resistance during 2009–2012.

Resistance to carbapenems in *E. coli* remains low in Europe.

Figure 3. *Escherichia coli*: percentage of invasive isolates with resistance to third-generation cephalosporins, EU/EEA, 2009 (top) and 2012 (bottom)

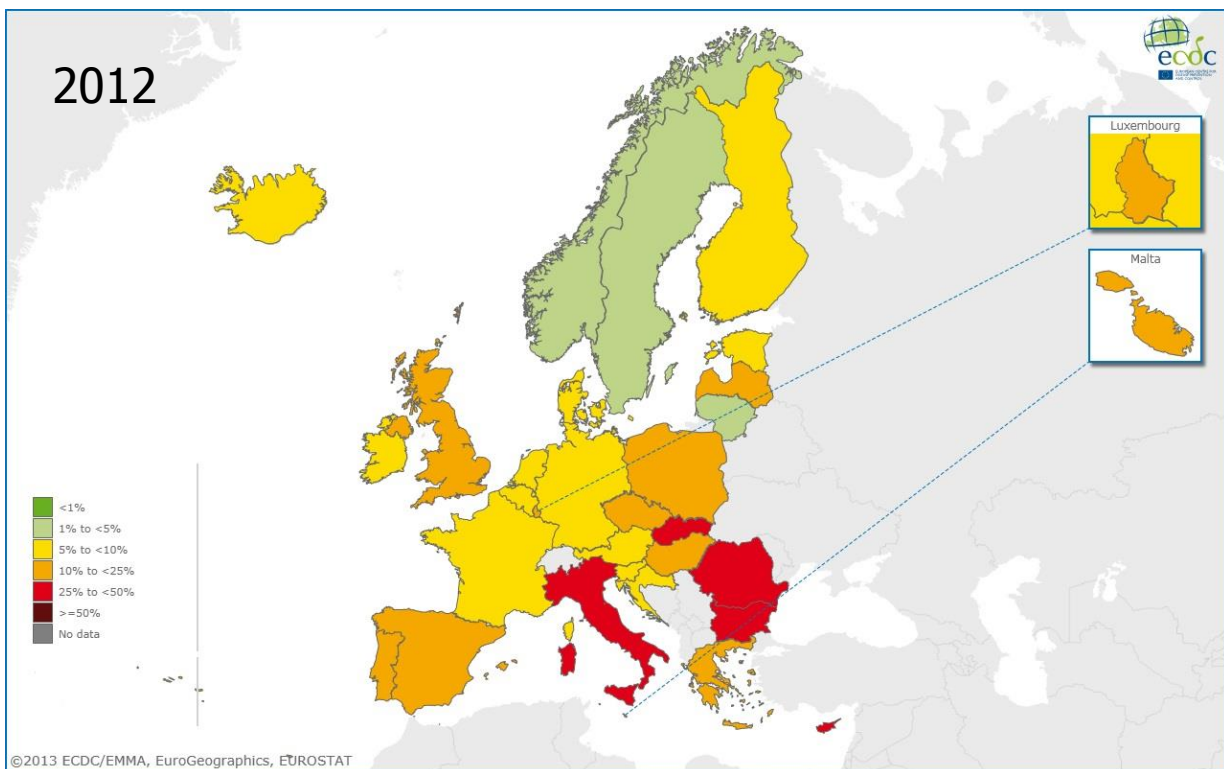
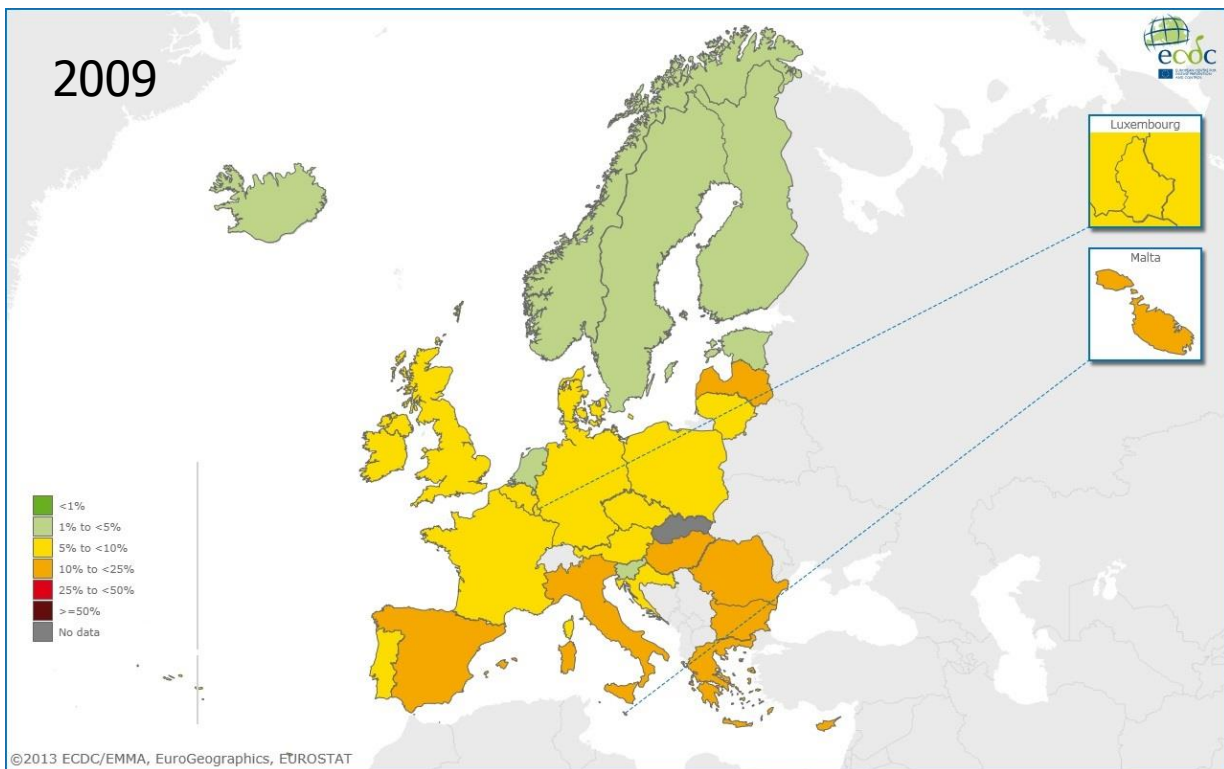
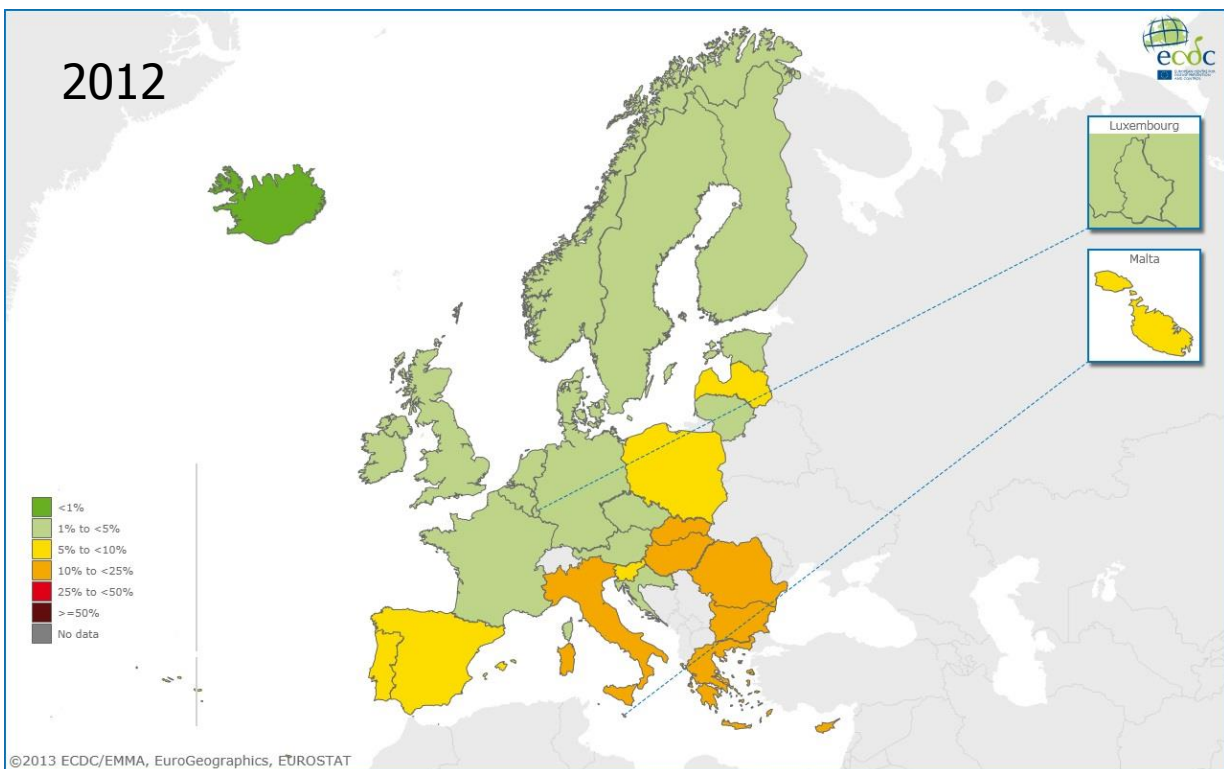
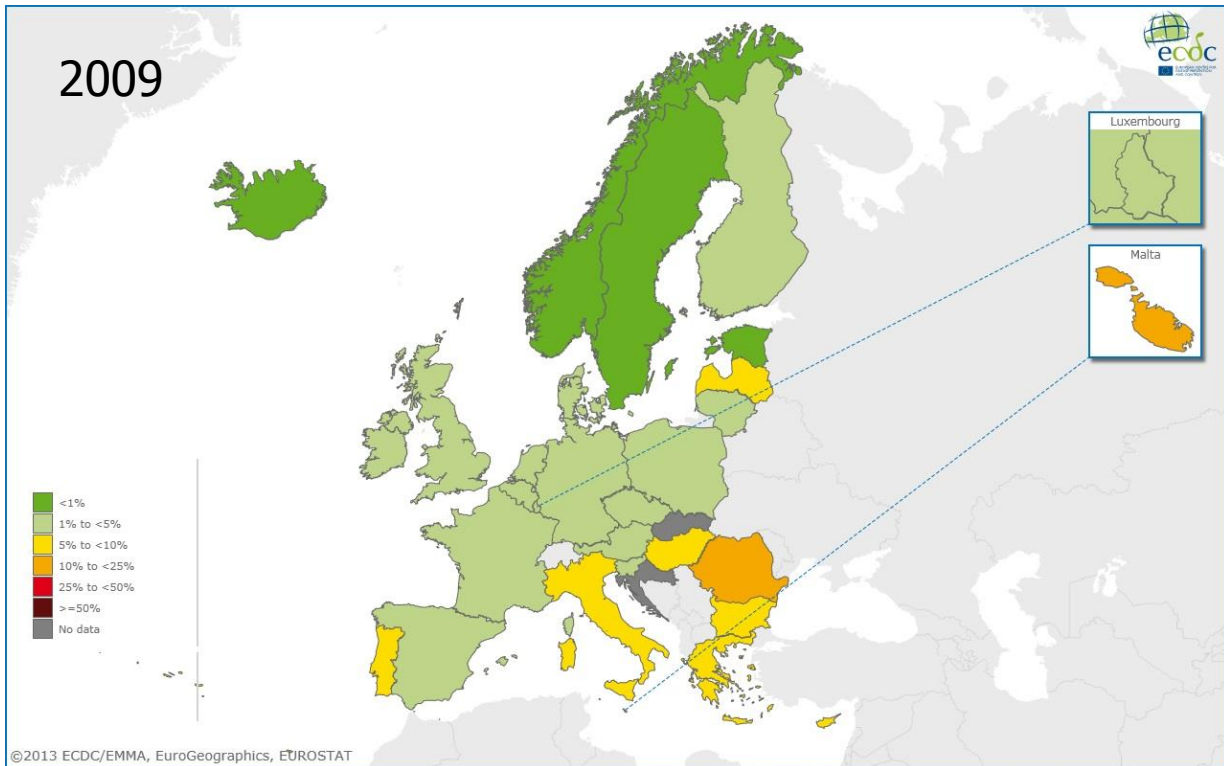


Figure 4. *Escherichia coli*: percentage of invasive isolates with combined resistance to third-generation cephalosporins, fluoroquinolones and aminoglycosides, EU/EEA, 2009 (top) and 2012 (bottom)

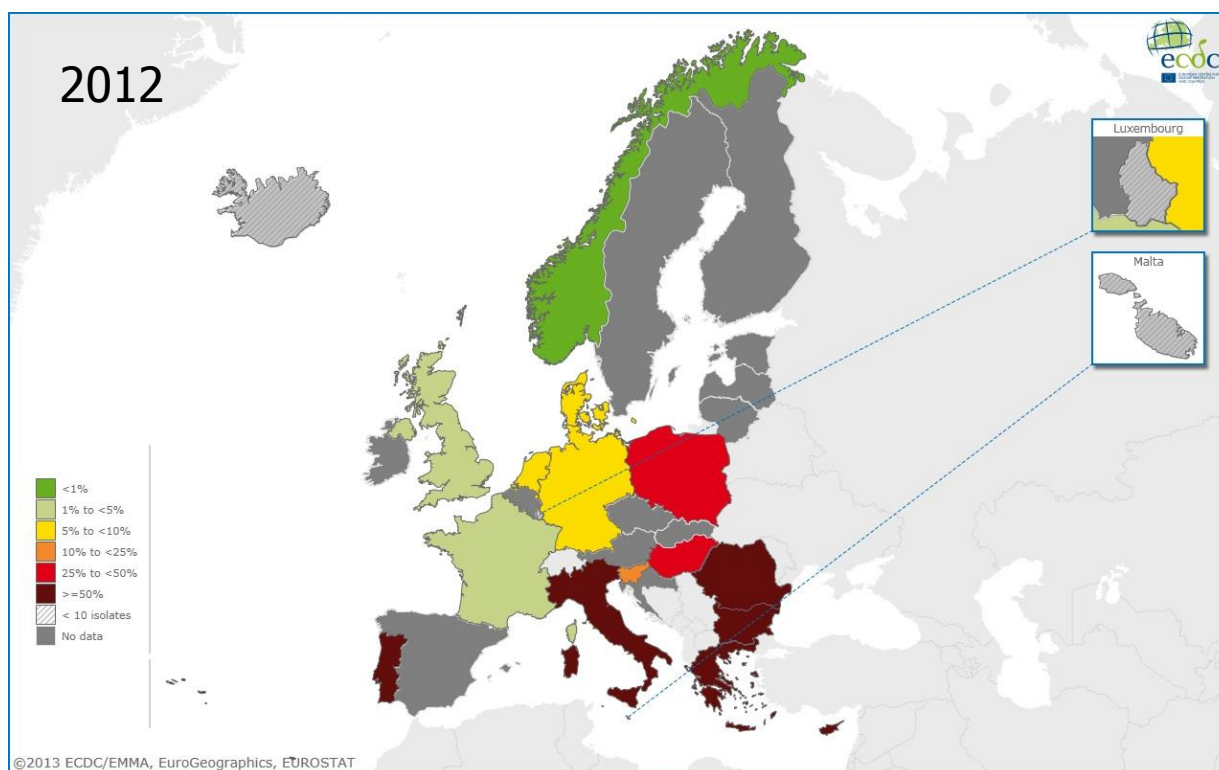


Acinetobacter species

For the first time, surveillance of antimicrobial resistance in *Acinetobacter* species was included in EARS-Net data collection, and 18 out of the 30 participating countries were able to provide data for 2012. Because this is the first year that such data have been collected by EARS-Net and because of the low numbers of isolates reported from most countries, results should be interpreted with caution.

Results from 2012 show large variations in antimicrobial resistance of *Acinetobacter* species in Europe, with generally very high resistance percentages reported from southern Europe and lower percentages in the north of Europe. Carbapenem resistance was above 25% in eight out of 18 countries, thus indicating seriously limited options for the treatment of patients infected with these bacteria (Figure 5).

Figure 5. *Acinetobacter* species: percentage of invasive isolates with resistance to carbapenems, EU/EEA, 2012



Meticillin-resistant *Staphylococcus aureus* (MRSA)

Meticillin-resistant *Staphylococcus aureus* (MRSA) is one of the most frequent causes of antibiotic-resistant healthcare-associated infections worldwide.

The EU/EEA population-weighted mean MRSA percentage has decreased significantly over the last four years, as a result of a decreasing trend in many individual European countries (Figure 6). Although these observations provide reasons for optimism, MRSA remains a significant public health problem. In 2012, the EU/EEA population-weighted mean MRSA percentage remained high at 18% in 2012, and seven out of 30 reporting countries had MRSA percentages above 25%, mainly in southern and eastern Europe (Figure 6).

Figure 6. *Staphylococcus aureus*: percentage of invasive isolates with resistance to meticillin (MRSA), EU/EEA, 2009 (top) and 2012 (bottom)

