

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

- Antibiotic resistance is a serious threat to public health in Europe, leading to increased healthcare costs, prolonged hospital stays, treatment failures and sometimes death.
- Over the last four years (2010 to 2013), the percentages of *K. pneumoniae* resistant to fluoroquinolones, third-generation cephalosporins and aminoglycosides, as well as combined resistance to all three antibiotic groups has increased significantly at EU/EEA level.
- During the same period, resistance to third-generation cephalosporins increased significantly at EU/EEA level for *E. coli*.
- Carbapenems are an important group of last-line antibiotics for treatment of infections involving multidrug-resistant Gram-negative bacteria such as *K. pneumoniae* and *E. coli*. Although carbapenem resistance remains at relatively low levels for most countries, the significant increase of the population-weighted EU/EEA mean percentage of carbapenem resistance in *K. pneumoniae* is a cause for serious concern and a threat to patient safety in Europe.
- In countries with high levels of multi-drug resistance, including resistance to carbapenems, only a few therapeutic options are available, among these are polymyxins. In these countries, presence of resistance to polymyxins is an important warning that options for the treatment of infected patients are becoming even more limited.
- For the second year running, antibiotic resistance data for *Acinetobacter* species are available through EARS-Net. Data for 2013 show large inter-country variations in Europe. High percentages (>25%) of isolates with combined resistance to fluoroquinolones, aminoglycosides and carbapenems were reported from southern and south-eastern Europe.
- The percentage of methicillin-resistant *Staphylococcus aureus* (MRSA) showed a significant decreasing trend at EU/EEA level for the period 2010 to 2013, but the decrease was less pronounced compared to the previous four-year period. Although the continuous decreasing trend at EU/EEA level gives reason for optimism, MRSA remains a public health problem in Europe. In 2013, the EU/EEA population-weighted mean MRSA percentage remained high, and seven out of 30 reporting countries had MRSA percentages above 25%.
- 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 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 Resistance 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 methods please refer to the EARS-Net Annual Report 2013 and the EARS-Net interactive database.*

Klebsiella pneumoniae

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

Antibiotic resistance in *K. pneumoniae* is a growing concern for public health in Europe. More than one third of the *K. pneumoniae* isolates reported to EARS-Net for 2013 were resistant to at least one antibiotic group under surveillance, and resistance to multiple antibiotic groups was common.

The EU/EEA population-weighted mean percentages of *K. pneumoniae* resistant to fluoroquinolones, third-generation cephalosporins, aminoglycosides, and combined resistance to all three antibiotic groups, increased significantly between 2010 and 2013. The increasing trend of combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides from 15% in 2010 to 21% in 2013 (Figure 1) means that for patients who are infected with these multidrug-resistant bacteria, only a few therapeutic options remain available. Among these are the carbapenems, a last-line group of antibiotics.

Although carbapenem resistance percentages remained at low levels for most countries in 2013, resistance to carbapenems has increased significantly at EU/EEA level over the last four years from a population-weighted mean percentage of 4.6% in 2010 to 8.3% in 2013 (Figure 2). Resistance to carbapenems was more frequently reported in *K. pneumoniae* bloodstream infections from south and south-eastern Europe than from other parts of Europe.

Data on polymyxin (e.g. colistin) resistance in *K. pneumoniae* were collected for the first time in 2013. Results should be interpreted with caution due to the low number of isolates tested and differences in laboratory methodology to determine susceptibility. Nevertheless, presence of polymyxin-resistant *K. pneumoniae* isolates with additional resistance to fluoroquinolones, third-generation cephalosporins, aminoglycosides and carbapenems was reported in southern and south-eastern Europe. Resistance to polymyxins is an important reminder that therapeutic options are becoming even more limited, particularly in countries where percentages of isolates with carbapenem resistance are already high.

* EARS-Net interactive 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, 2010 (top), 2013 (bottom)

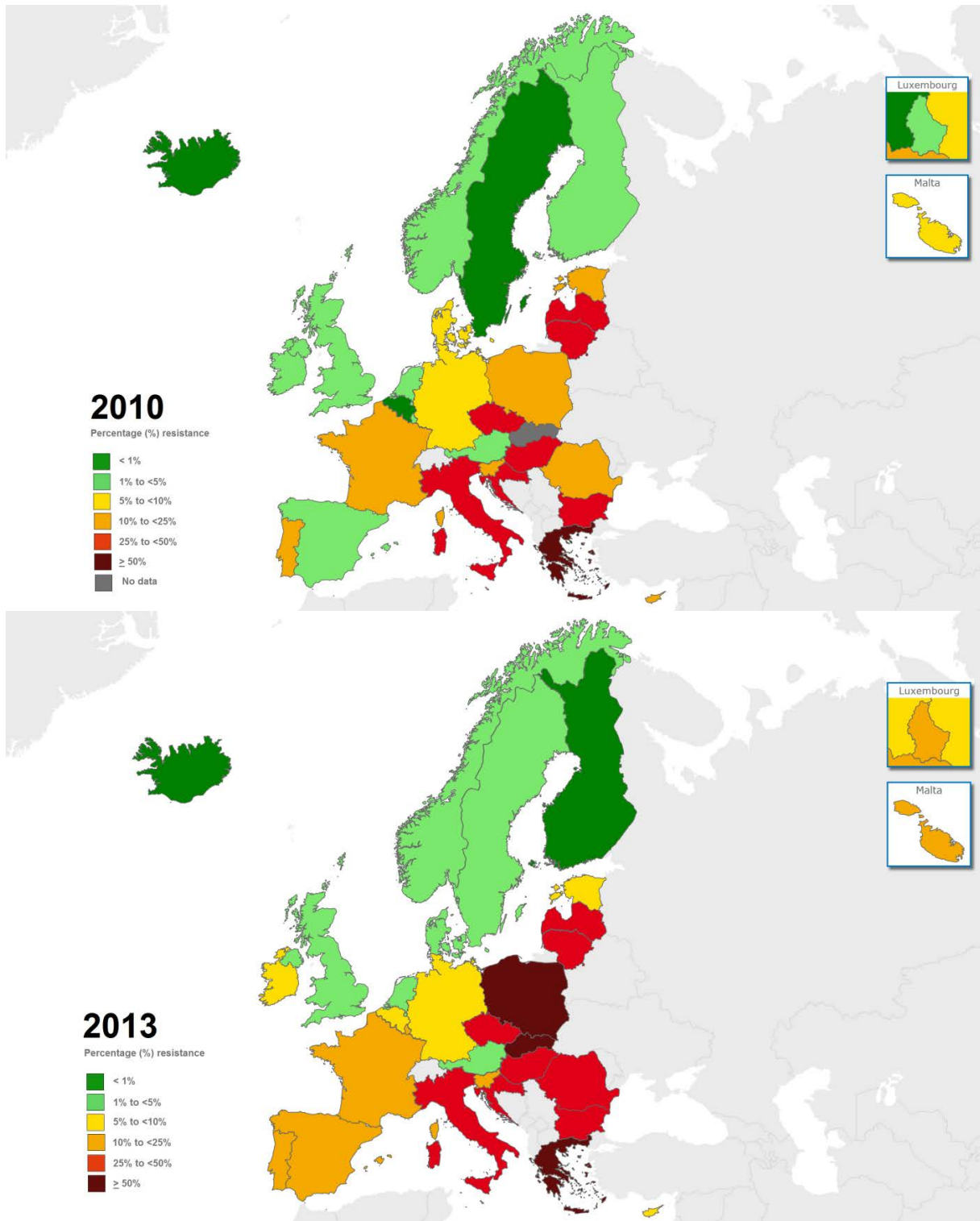
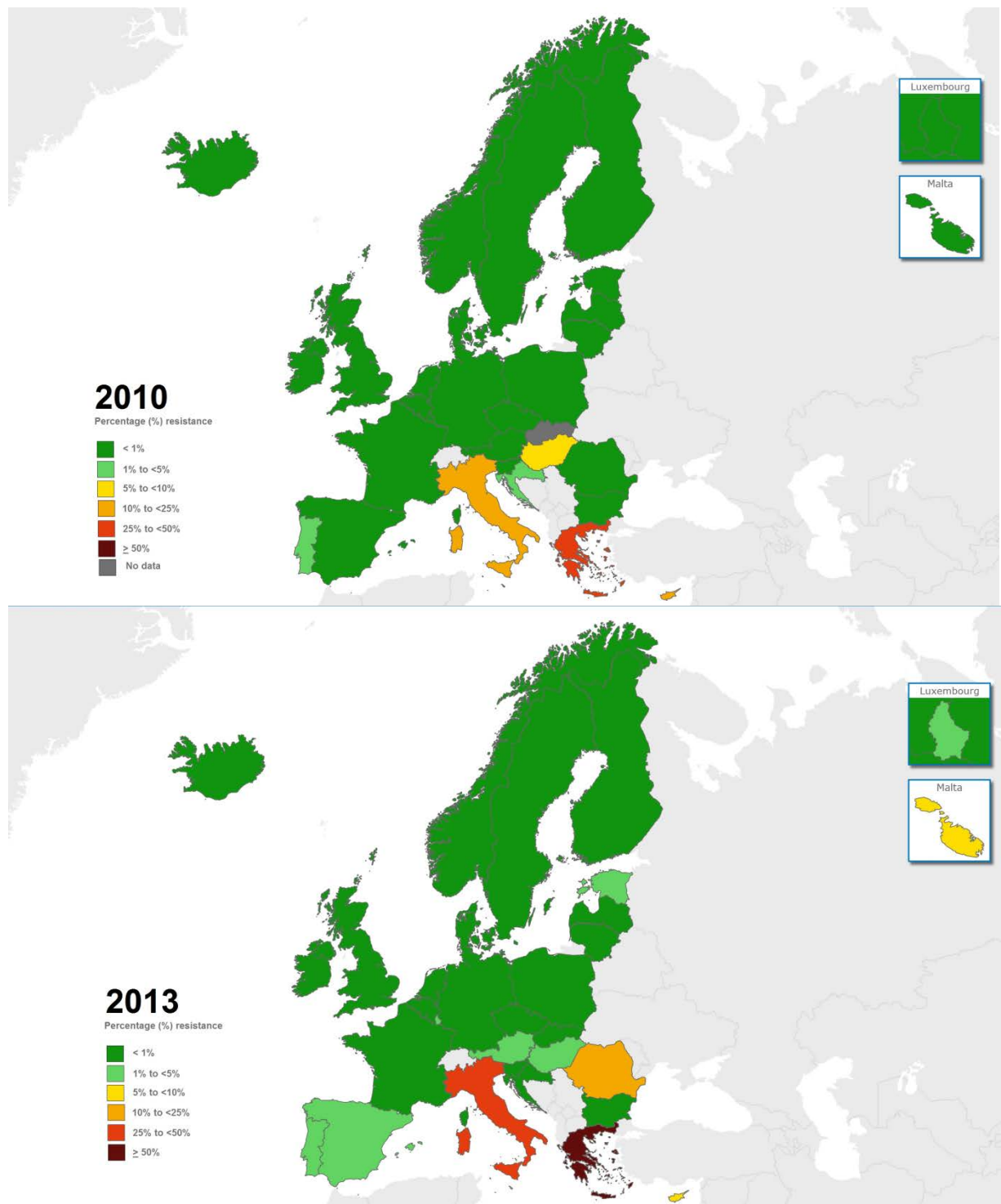


Figure 2. *Klebsiella pneumoniae*: percentage of invasive isolates with resistance to carbapenems, EU/EEA, 2010 (top), 2013 (bottom)



Escherichia coli

Escherichia coli is one of the most frequent causes of bloodstream infections and community- and healthcare-associated urinary tract infections worldwide.

Antibiotic resistance in *E. coli* requires close attention as the percentages of isolates resistant to commonly used antibiotics continue to increase throughout Europe. More than half of the isolates reported to EARS-Net in 2013 were resistant to at least one antibiotic under surveillance.

Of particular concern is the increase in resistance to third-generation cephalosporins (Figure 3) and combined resistance to third-generation cephalosporins, fluoroquinolones and aminoglycosides (Figure 4). Several countries reported statistically significant increasing trends for these types of resistance during the period 2010–2013. The trend for the population-weighted EU/EEA mean percentage of resistance to third-generation cephalosporins increased significantly, from 9.5% in 2010 to 12.6% in 2013, while there was no significant increase in the percentage of combined resistance during the same period.

Resistance to carbapenems in *E. coli* remains low in Europe, but is increasing in a few countries, especially in southern and south-eastern Europe.

Figure 3. *Escherichia coli*: percentage of invasive isolates with resistance to third-generation cephalosporins, EU/EEA, 2010 (top), 2013 (bottom)

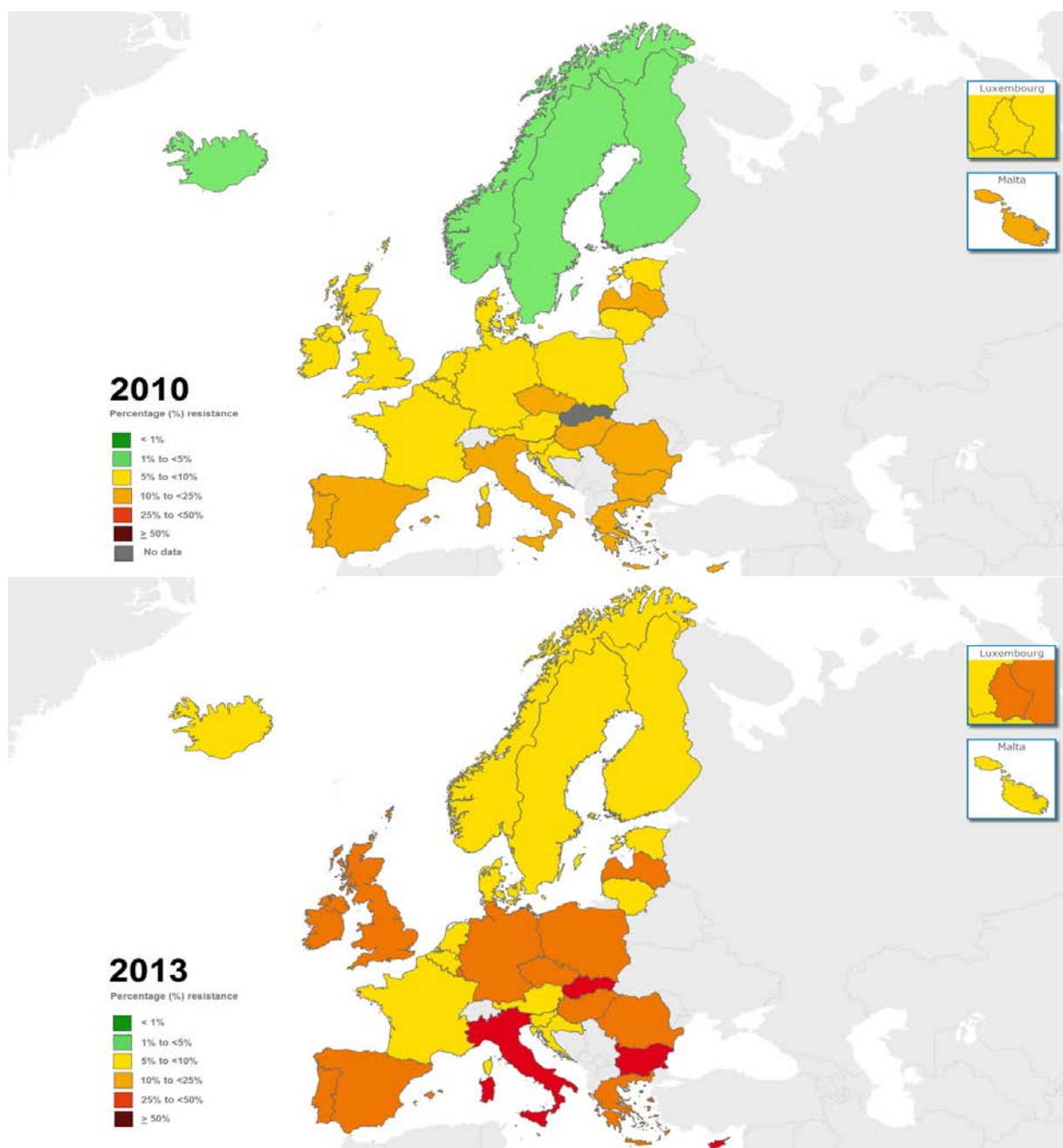
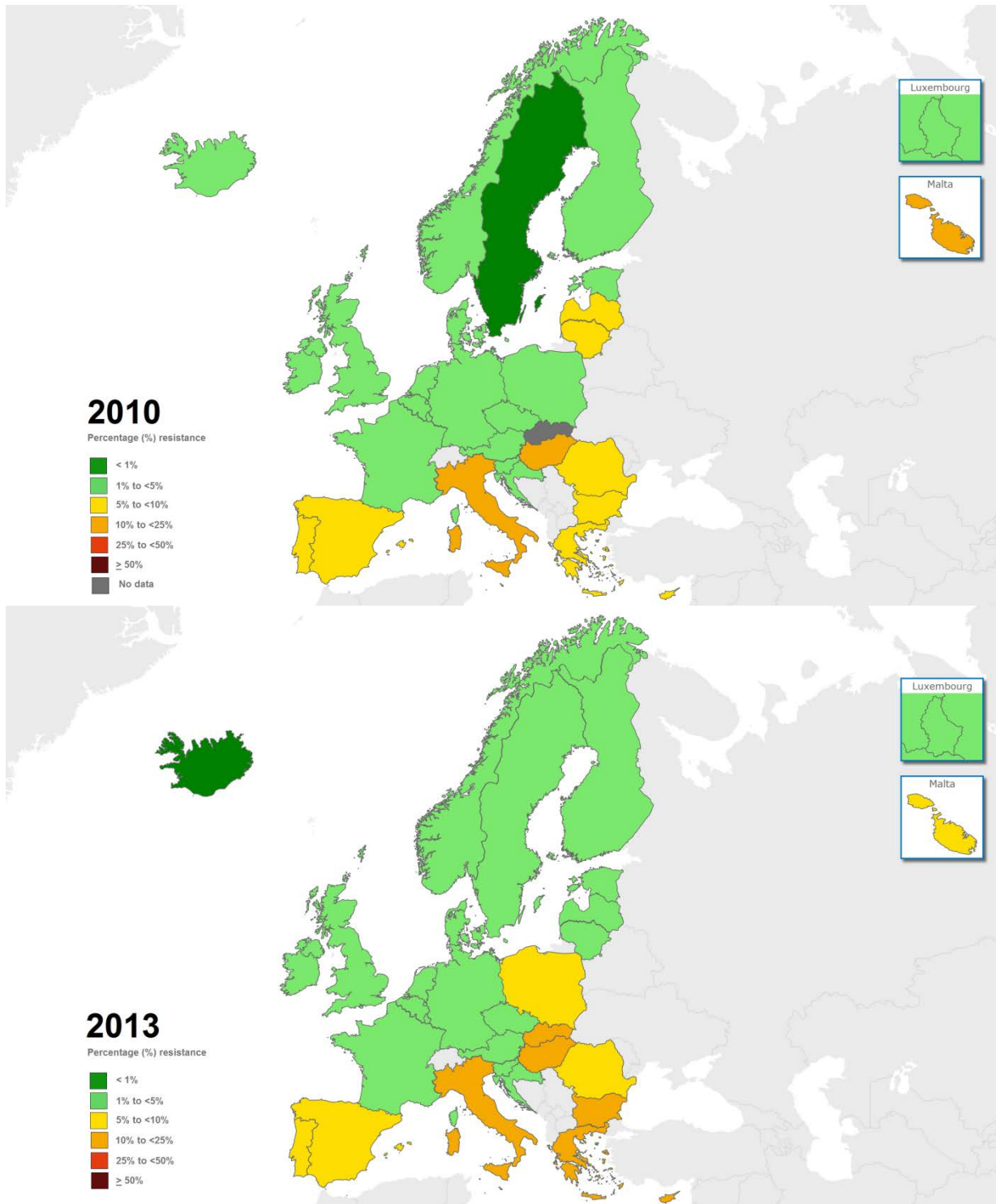


Figure 4. *Escherichia coli*: percentage of invasive isolates with combined resistance to third-generation cephalosporins, fluoroquinolones and aminoglycosides, EU/EEA, 2010 (top), 2013 (bottom)



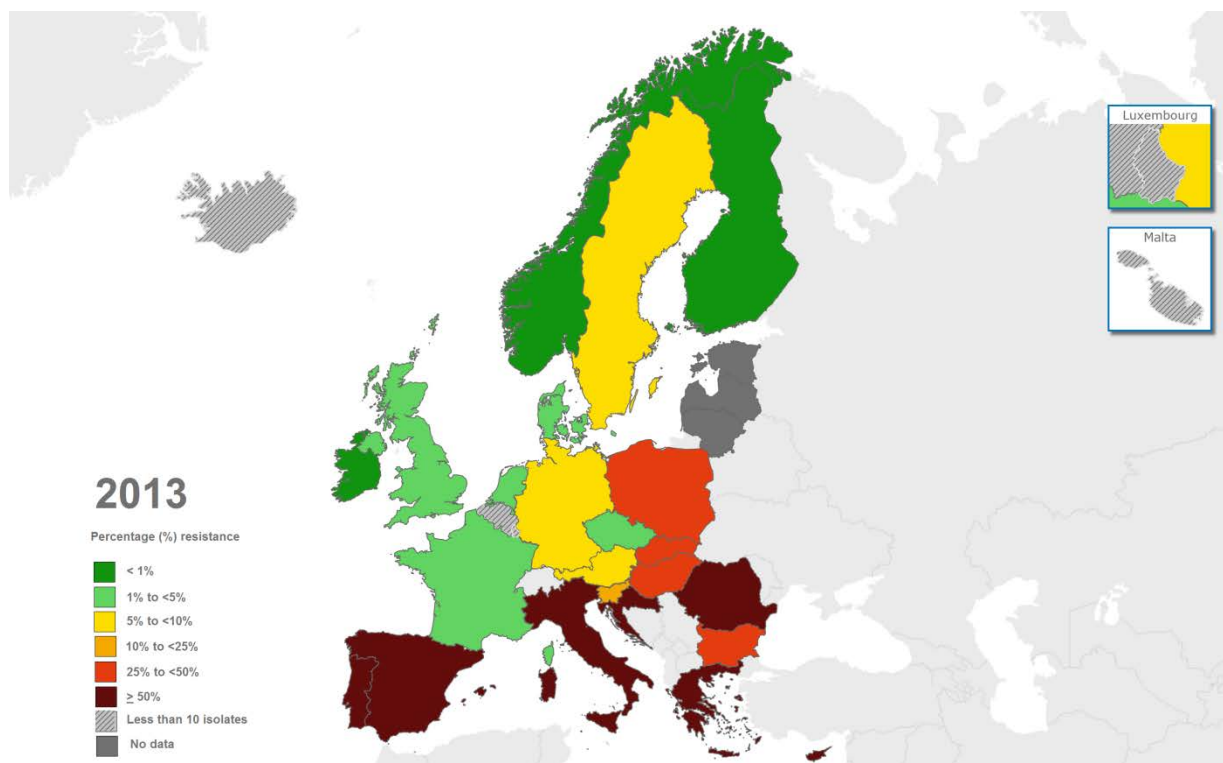
Acinetobacter species

Acinetobacter species cause healthcare-associated infections such as pneumonia and bloodstream infections, including hospital outbreaks. Surveillance of *Acinetobacter* species was included in EARS-Net for a test period of two years starting in 2012. Twenty-seven out of the 30 EU/EEA countries reported data for 2013.

Antibiotic resistance in *Acinetobacter* species showed large variations across Europe, with generally very high resistance percentages reported from southern Europe and lower percentages in northern Europe. Combined resistance to fluoroquinolones, aminoglycosides and carbapenems was equal to or more than 20% in 12 out of 23 countries reporting susceptibility results for 10 or more isolates, thus indicating seriously limited options for the treatment of patients infected with *Acinetobacter* species (Figure 5).

Resistance to polymyxins – a group of last-line antibiotics – was observed in 5% of the isolates, mostly from southern Europe. These results should be interpreted with caution due to the low number of isolates tested and differences in laboratory methodology to determine susceptibility. Nevertheless, they give an important indication of the treatment challenges for European patients infected with *Acinetobacter* species.

Figure 5. *Acinetobacter* species: percentage of invasive isolates with combined resistance to fluoroquinolones, aminoglycosides and carbapenems, EU/EEA, 2013



Meticillin-resistant *Staphylococcus aureus* (MRSA)

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

As in previous years, large inter-country variations in MRSA percentages were observed across Europe in 2013, with percentages ranging from under 1% to over 60%. The EU/EEA population-weighted mean MRSA percentage decreased significantly between 2010 and 2013 (Figure 6), although the decrease was less pronounced than in the period 2009–2012.

Although the continuous decreasing trend at EU/EEA level gives reason for optimism, MRSA remains a public health problem in Europe. In 2013, the EU/EEA population-weighted mean MRSA percentage remained high at 18%, 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, 2010 (top), 2013 (bottom)

