



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

EARS-Net surveillance data  
November 2017

- For most bacteria reported to the European Antimicrobial Resistance Surveillance Network (EARS-Net) for 2016, antibiotic resistance percentages varied widely across Europe. Resistance percentages were generally higher in southern and south-eastern Europe than in northern Europe.
- For *Klebsiella pneumoniae*, more than one third of the isolates reported to EARS-Net for 2016 were resistant to at least one of the antibiotic groups under surveillance, and combined resistance to three or more of the antimicrobial groups was the most common resistance phenotype.
- For *Escherichia coli*, resistance to third-generation cephalosporins and combined resistance to third-generation cephalosporins, fluoroquinolones and aminoglycosides increased significantly at EU/EEA level between 2013 and 2016.
- Carbapenems are an important group of last-line antibiotics for the treatment of infections with multidrug-resistant gram-negative bacteria such as *K. pneumoniae* and *E. coli*. In 2016, carbapenem resistance in *E. coli* remained rare, and most countries reported low levels for *K. pneumoniae*. However, a small group of countries, mainly those with high resistance percentages to other antibiotic groups, reported considerably higher carbapenem resistance percentages for *K. pneumoniae*.
- For *Acinetobacter* species, high percentages of isolates with combined resistance to fluoroquinolones, aminoglycosides and carbapenems were reported from the Baltic countries, southern and south-eastern Europe in 2016.
- In countries with high levels of multi-drug resistance, including resistance to carbapenems, only a few therapeutic options are available, for example colistin. In these countries, the presence of isolates with resistance to colistin is a serious warning that options for the treatment of infected patients are becoming even more limited.
- The percentage of methicillin-resistant *Staphylococcus aureus* (MRSA) decreased significantly at EU/EEA level between 2013 and 2016. Despite this positive development, MRSA remains a public health priority in Europe as ten out of thirty countries reported MRSA percentages above 25%.
- Between 2013 and 2016, significantly increasing trends of vancomycin-resistant *Enterococcus faecium* were noted for seven of the 25 countries that reported more than 20 isolates per year during this period. Increasing trends were more common in countries reporting comparatively high resistance percentages. Although a similar increase was not seen at EU/EEA level, this might indicate a change in the epidemiology for this pathogen in Europe.
- Prudent antibiotic use and comprehensive infection prevention and control strategies targeting all healthcare sectors (acute care, long-term care facilities and ambulatory care) are the cornerstones for effective intervention to prevent the 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. For 2016, a total of 30 countries reported data to EARS-Net, including all EU Member States and two EEA countries (Iceland and Norway). This summary highlights some of the results from the EARS-Net Annual Report 2016<sup>1</sup>. For more detailed data and analyses including tables with country level percentages and trends, please refer to the EARS-Net Annual Report 2016<sup>1</sup> and the ECDC Surveillance Atlas of Infectious Diseases<sup>2</sup>.

EARS-Net data for 2016 show that antimicrobial resistance remains a serious threat to public health in Europe. For invasive bacterial infections, prompt treatment with effective antimicrobial agents is especially important and is one of the single most effective interventions to reduce the risk of a fatal outcome. The high percentages of isolates with resistance to key antimicrobial groups reported from many countries are therefore of great concern and represent a serious threat to patient safety in Europe. Prudent antimicrobial use and comprehensive infection prevention and control strategies targeting all healthcare sectors are the cornerstones of effective intervention to prevent the selection and transmission of bacteria resistant to antimicrobial agents.

### *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, if appropriate prevention and control measures are not taken.

Antibiotic resistance in *K. pneumoniae* is a public health concern in Europe. More than one third of the *K. pneumoniae* isolates reported to EARS-Net for 2016 were resistant to at least one of the antibiotic groups under surveillance (fluoroquinolones, third-generation cephalosporins, aminoglycosides and carbapenems), and combined resistance to multiple antibiotic groups was common. A north to south and south-east gradient was noted for most antimicrobial groups, with generally lower resistance percentages reported from northern European countries and higher percentages from the southern and south-eastern parts of Europe (Figures 1 and 2).

There is some indication that the overall resistance situation for *K. pneumoniae* is stabilising at EU/EEA level. For combined resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides, there was a small significant decrease in the EU/EEA population-weighted mean percentage (based on laboratories reporting consistently during the period) between 2013 and 2016. However, this encouraging development was not always observed at national level, with some countries still showing an increase in combined resistance of *K. pneumoniae*.

In 2016, carbapenem resistance percentages remained at low levels for most countries, while a smaller group of countries, mainly those with high resistance percentages to other antimicrobial groups, reported considerably higher levels. The vast majority of the carbapenem-resistant isolates had additional resistance to fluoroquinolones, third-generation cephalosporins and aminoglycosides. No significant change was noted in the EU/EEA population-weighted mean percentage (based on laboratories reporting consistently during the period) for carbapenem resistance between 2013 and 2016.

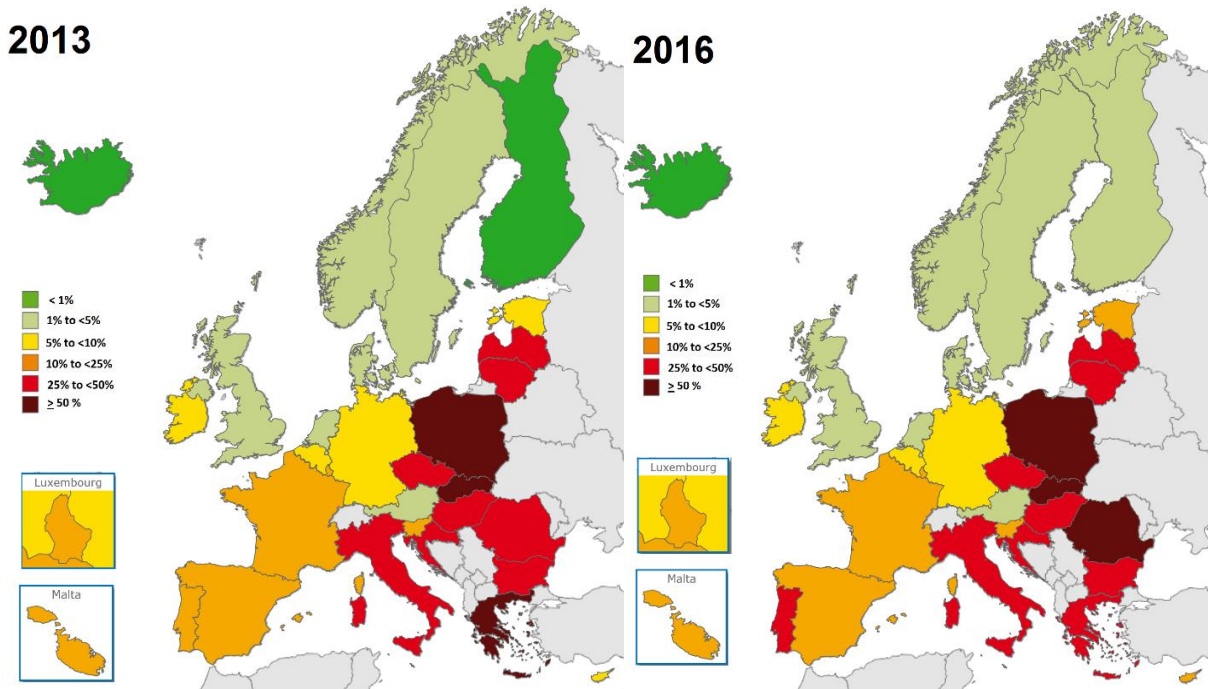
Very few therapeutic options remain available for patients infected with multidrug-resistant *K. pneumoniae* with additional resistance to carbapenems, and are often limited to combination therapy and older antibiotics, such as colistin, an antibiotic from the polymyxins group. Emergence of resistance to colistin, one of the few remaining treatment alternatives, especially in countries with already high levels of carbapenem resistance, is therefore of concern (Figure 4). However, as routine colistin susceptibility testing has several methodological issues, the extent of the problem is difficult to assess based on EARS-Net data.

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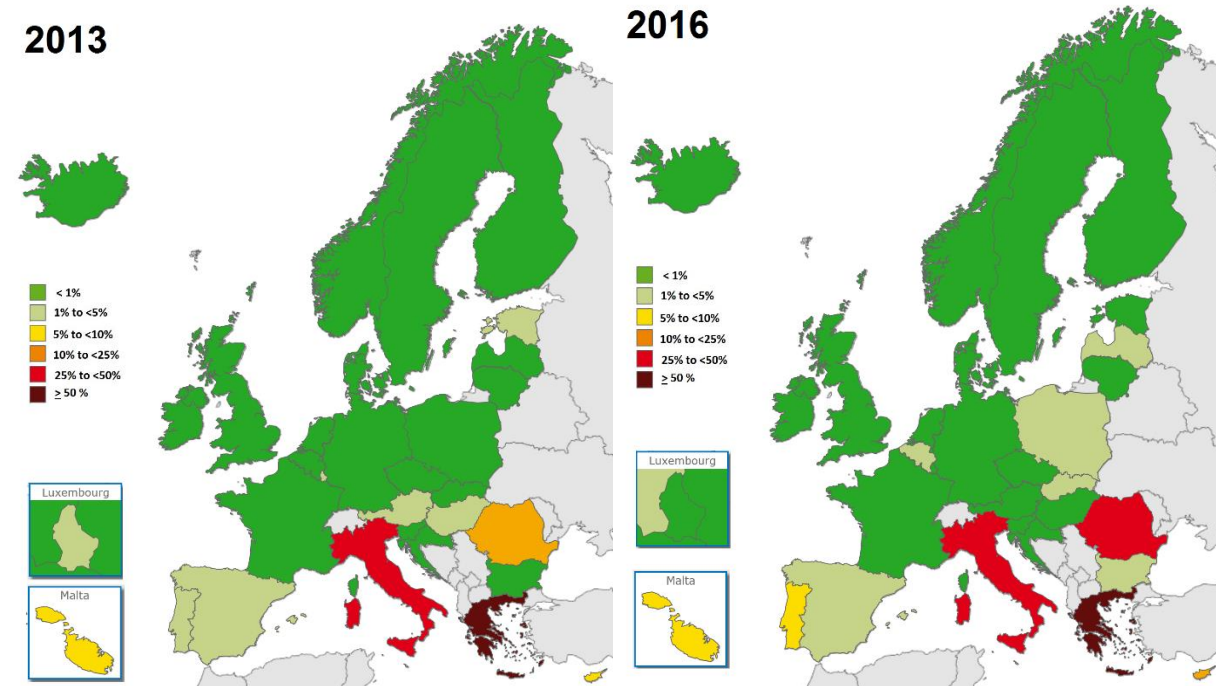
1. European Centre for Disease Prevention and Control. Surveillance of antimicrobial resistance in Europe 2016. Annual Report of the European Antimicrobial Resistance Surveillance Network (EARS-Net). Stockholm: ECDC; 2017. Publication pending, November 2017.

2. European Centre for Disease Prevention and Control. Surveillance Atlas of Infectious Diseases. Available from: <https://atlas.ecdc.europa.eu/public/index.aspx>

**Figure 1. *Klebsiella pneumoniae*: percentage of invasive isolates with combined resistance to third-generation cephalosporins, fluoroquinolones and aminoglycosides, EU/EEA, 2013 (left), 2016 (right)**

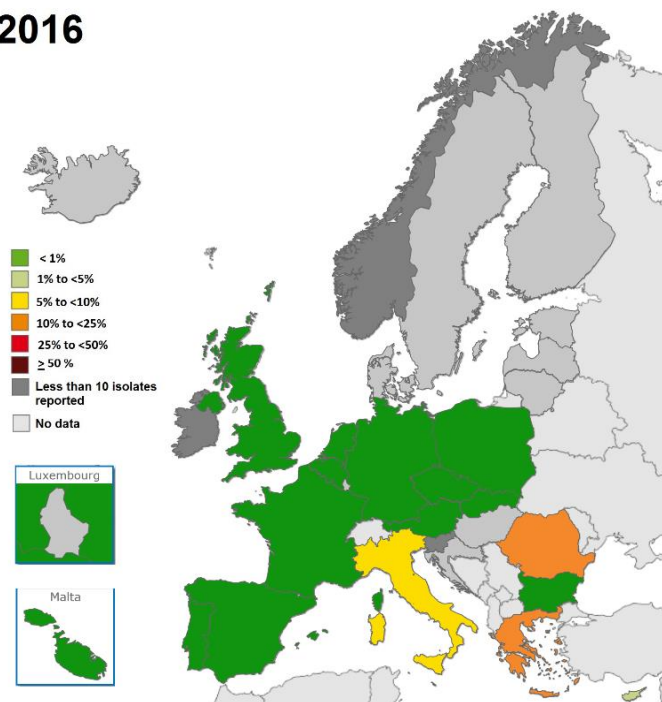


**Figure 2. *Klebsiella pneumoniae*: percentage of invasive isolates with resistance to carbapenems, EU/EEA, 2013 (left), 2016 (right)**



**Figure 3. *Klebsiella pneumoniae*: percentage of invasive isolates with combined resistance to carbapenems and colistin\*, EU/EEA, 2016**

**2016**



\* All isolates tested for carbapenem susceptibility were included in the denominator to limit the effect of sequential testing

## *Escherichia coli*

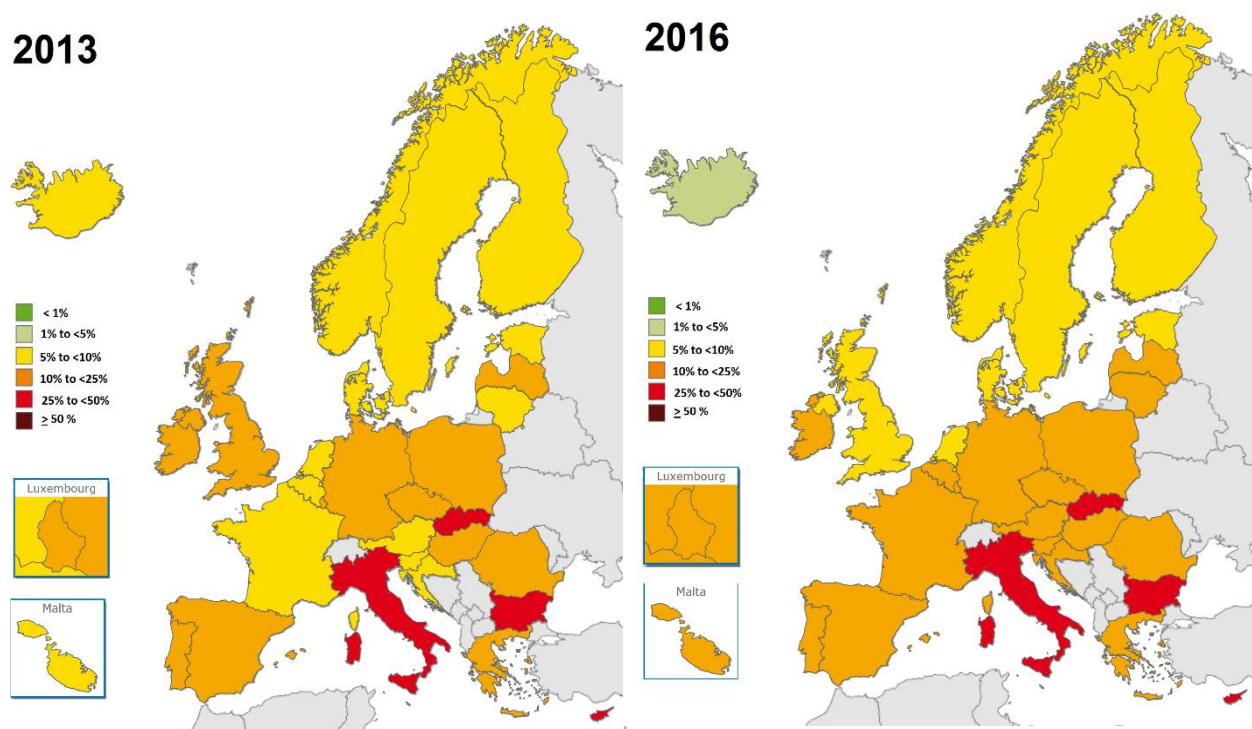
*Escherichia coli* is one of the most frequent causes of bloodstream infections and community- and healthcare-associated urinary tract infections worldwide.

Antibiotic resistance in *E. coli* requires close attention as the percentage of isolates resistant to commonly-used antibiotics continues to increase throughout Europe. More than half of the isolates reported to EARS-Net in 2016 were resistant to at least one of the antibiotic groups under surveillance (aminopenicillins, fluoroquinolones, third-generation cephalosporins, aminoglycosides and carbapenems). The highest resistance percentages were reported from southern and south-eastern Europe (Figures 4 and 5).

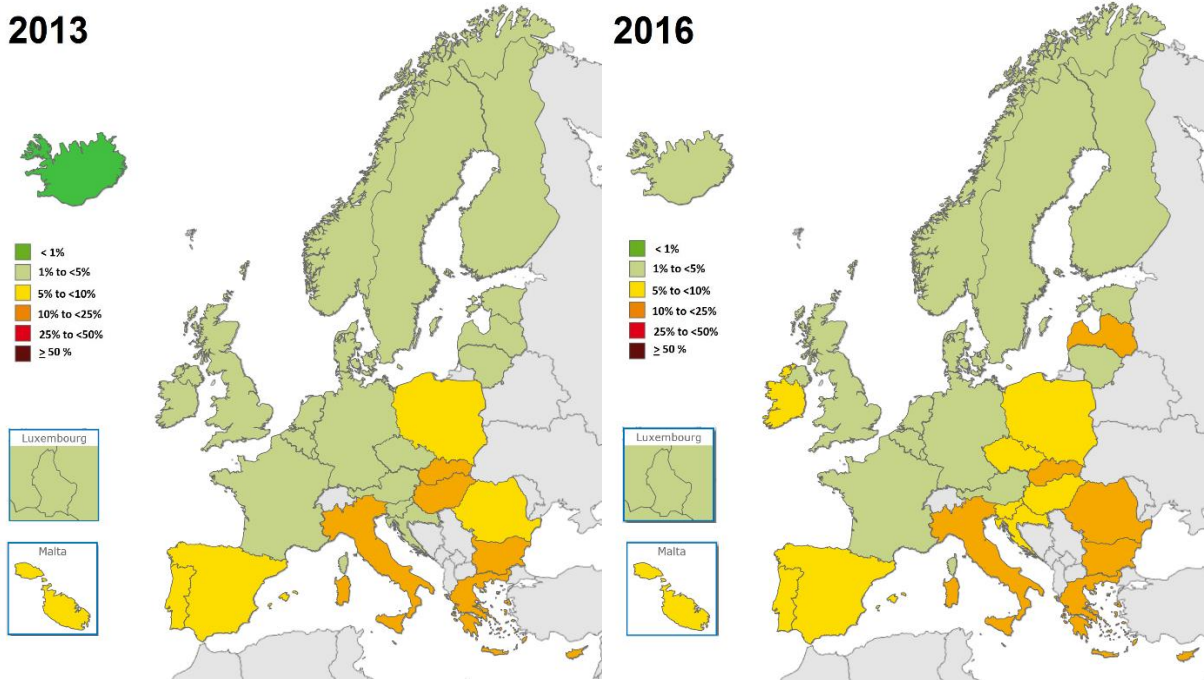
Of particular concern are the increases in resistance to third-generation cephalosporins and combined resistance to third-generation cephalosporins, fluoroquinolones and aminoglycosides which increased significantly at EU/EEA level as well as in several individual countries (based on laboratories reporting consistently during the period) between 2013 and 2016.

Resistance to carbapenems in *E. coli* remained low (<0.1%) in the EU/EEA.

**Figure 4. *Escherichia coli*: percentage of invasive isolates with resistance to third-generation cephalosporins, EU/EEA, 2013 (left), 2016 (right)**



**Figure 5. *Escherichia coli*: percentage of invasive isolates with combined resistance to third-generation cephalosporins, fluoroquinolones and aminoglycosides, EU/EEA, 2013 (left), 2016 (right)**

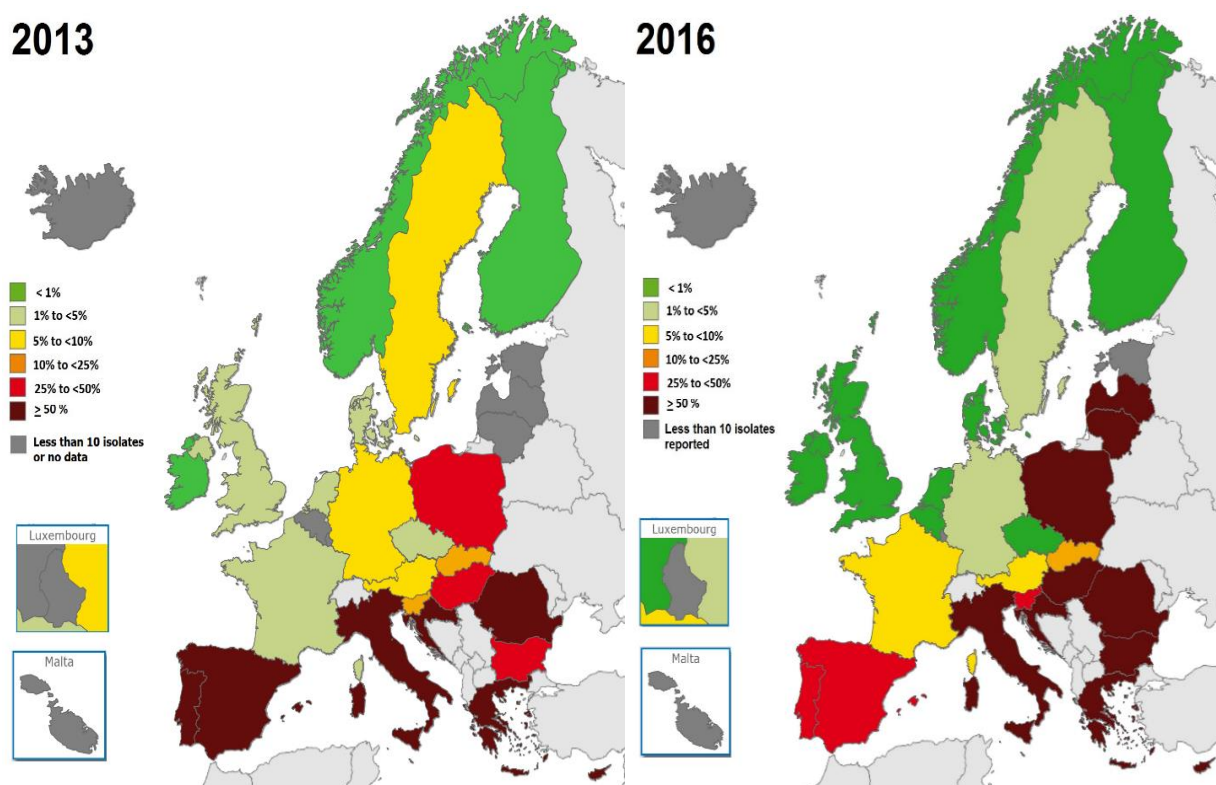


## Acinetobacter species

*Acinetobacter* species mainly cause healthcare-associated infections, such as pneumonia and bloodstream infections, and often result in hospital outbreaks if appropriate prevention and control measures are not implemented. *Acinetobacter* species can persist in the healthcare environment and are difficult to eradicate once established.

Antibiotic resistance in *Acinetobacter* species showed large variations across Europe, with generally high resistance percentages reported from the Baltic countries, southern and south-eastern Europe (Figure 6). Combined resistance to fluoroquinolones, aminoglycosides and carbapenems was the most frequently reported resistance phenotype in 2016, and accounted for almost half of the reported isolates. Ten out of 26 countries reporting resistance results for 10 or more isolates had percentages of 50% or higher for this type of combined resistance (Figure 6). This is an indication of seriously limited options for the treatment of patients infected with *Acinetobacter* species in these countries.

**Figure 6. *Acinetobacter* species: percentage of invasive isolates with combined resistance to fluoroquinolones, aminoglycosides and carbapenems, EU/EEA, 2013 (left), 2016 (right)**



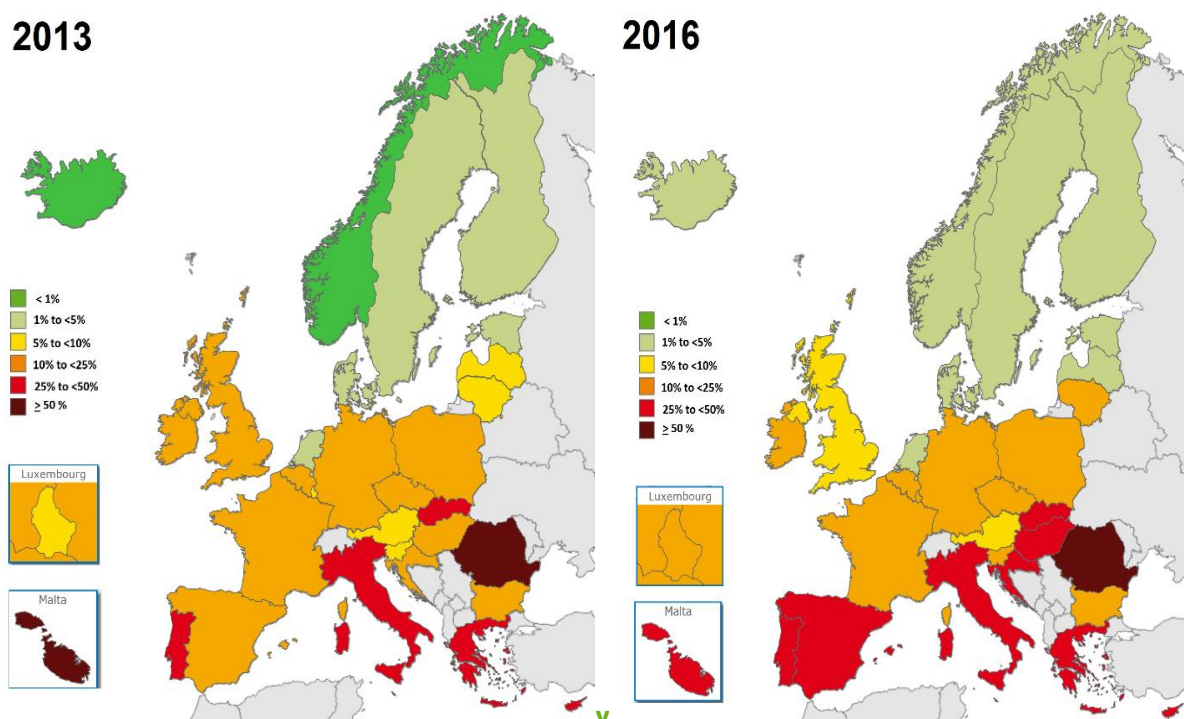
## Meticillin-resistant *Staphylococcus aureus* (MRSA)

Meticillin-resistant *Staphylococcus aureus* (MRSA) is one of the most frequent causes of antibiotic-resistant healthcare-associated infections worldwide. In addition, increasing levels of community-associated MRSA are being reported from many parts of the world, including Europe.

In 2016, as in previous years, large inter-country variations in MRSA percentages among invasive isolates of *S. aureus* were observed across Europe (Figure 7). The EU/EEA population-weighted mean MRSA percentage (based on laboratories reporting consistently during the period) decreased significantly between 2013 and 2016. Similar decreasing trends were noted in ten out of the 29 countries for which trend analyses could be performed.

Despite this positive development, MRSA remains a public health priority in Europe as ten out of 30 countries reported MRSA percentages above 25% (Figure 7). Comprehensive MRSA control strategies targeting all healthcare sectors (acute care, long-term care and ambulatory care) remain essential to sustain the reduction of MRSA spread in Europe.

**Figure 7. *Staphylococcus aureus*: percentage of invasive isolates with resistance to meticillin (MRSA), EU/EEA, 2013 (left), 2016 (right)**





## Vancomycin-resistant enterococci (VRE)

*Enterococcus faecium* and *Enterococcus faecalis* can cause a variety of infections, including endocarditis, bloodstream infections, and urinary tract infections. Vancomycin-resistant enterococci (VRE) mainly cause healthcare-associated infections and often result in hospital outbreaks if appropriate prevention and control measures are not implemented.

In 2016, as in previous years, vancomycin resistance was more common with *E. faecium* than *E. faecalis*. For *E. faecium*, high percentages of vancomycin resistance were reported from countries in eastern and southeastern Europe and in Ireland (Figure 8). Between 2013 and 2016, there was no significant trend for the EU/EEA population-weighted mean percentage (based on laboratories reporting consistently during the period) of vancomycin-resistant *E. faecium* isolates. However, a significant increase in the percentage of vancomycin-resistant *E. faecium* isolates was observed in seven out of the 25 countries reporting more than 20 isolates per year during 2013–2016. Increasing trends were more common in countries reporting comparatively high resistance percentages.

**Figure 8. *Enterococcus faecium*: percentage of invasive isolates with resistance to vancomycin, EU/EEA, 2013 (left), 2016 (right)**

