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Home Page

Back to Home Page »

Contents

Dominic Whyte 1965 - 2009

Antimicrobial resistance surveillance in Ireland: marking 10 years of EARSS, 1999-2009

Measles outbreak escalates

Childhood vaccination rates at record levels

World AIDS Day, December 1st 2009

Latest HPSC reports

Health Protection Surveillance Centre
25-27 Middle Gardiner St
Dublin 1

Tel: +353 (0) 1 8765300
Fax: +353 (0) 1 8561299
info@hpsc.ie
www.hpsc.ie

Antimicrobial resistance surveillance in Ireland: marking 10 years of EARSS, 1999-2009

Introduction

The European Antimicrobial Resistance Surveillance System (EARSS) was established in 1999 following on from a very important meeting "The Microbial Threat" in Copenhagen in 1998 that identified antimicrobial resistance as one of the most important threats to public health in Europe and made recommendations on strategies to prevent and control the emergence and spread of antimicrobial resistance. Ireland was one of the original countries that signed up to the network that today boasts 33 countries covering over almost 900 laboratories and over 1500 hospitals. The Irish EARSS Network has equally grown in strength over the years from 12 laboratories representing 22 acute hospitals (both public and private), as well as other non-acute healthcare settings, giving approximately 58% coverage of the population in 1999 to all 44 laboratories representing 59 acute hospitals providing complete coverage of the country in 2009. The pathogens covered by EARSS have expanded from *Staphylococcus aureus* and *Streptococcus pneumoniae* in 1999 and now include five additional pathogens: *Escherichia coli*, *Enterococcus faecalis* and *Enterococcus faecium* (as of 2001) and *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* (as of 2005). EARSS does not distinguish clinically significant isolates from contaminants and primarily serves as a surveillance system to measure national levels of antimicrobial resistance (AMR).

Case definition used by EARSS

EARSS collects routinely-generated antimicrobial susceptibility testing data on the "primary" or first invasive isolate of each pathogen per patient per quarter, i.e. if a resistant strain is isolated subsequent to a susceptible over a quarter, only the susceptible strain is counted, and *vice versa*. No distinction is made between clinically significant and non-significant isolates. The data that are collected include basic demographic data on the patients (e.g. laboratory specimen number, date of birth and gender; no patient names are submitted) and antimicrobial susceptibility testing data on the pathogen. For each pathogen, the protocol requires that certain key antibiotic results are provider (see Table 1). The data are analysed on a quarterly and annual basis and the key findings are fed back to all data providers and are made available to the public on our website (www.hpsc.ie).

The results are presented as the total number of isolates for each of the pathogens and the proportions of all isolates tested that are resistant to each of the key antibiotics. We can then look at the national trends in resistance over time, as in our quarterly and annual reports, or at the local trends by hospital and compared to the regional or national data and/or similar types of hospitals, as in our latest reports on *S. aureus* (of which MRSA is a subset). We have also started to measure rates of infection/disease, which are more reliable indicators of the burden of the infection/disease on the population at risk. For pathogens associated with hospital-acquired infections, we report the rate per 1,000 bed days used (occupied bed days or patient days), while for community-acquired infections, we report rates per 100,000 population.

EARSS provides a means by which resistance proportions can be compared across Europe, but as always it

should be borne in mind that each country has a different healthcare system and the resources available and policies in place go some way to explain why, but not always how, these differences have come to be. In much the same way, we urge caution when comparing individual hospitals in this country, none of which are directly comparable due to differences in specialities and case mixes, infra-structure, staffing levels, infection control and antibiotic prescribing policies, etc.

Click here for a summary table of the EARSS data by pathogen and year, including 2009 (to the end of Quarter 2).

Table 1. *EARSS pathogens and specimens (i.e. associated with invasive infections) included and key "indicator" antibiotic data collected*

Pathogen	Specimens included	Key antibiotic data collected
S. aureus	Blood only	Meticillin
S. pneumoniae	Blood and/CSF	Penicillin
		Erythromycin
E. coli	Blood and/CSF	Ampicillin
		3rd Generation Cephalosporins (e.g. ceftazidime)
		Ciprofloxacin
		Gentamicin
		Plus test for presence of ESBL*
E. faecalis/E. faecium	Blood only	Ampicillin
		High-Level Gentamicin
		Vancomycin
K. pneumoniae	Blood and/CSF	Ampicillin
		3rd Generation Cephalosporins (e.g. ceftazidime)
		Ciprofloxacin
		Gentamicin
		Plus test for presence of ESBL*
P. aeruginosa	Blood and/CSF	Piperacillin-tazobactam
		Ceftazidime
		Meropenem
		Ciprofloxacin
		Gentamicin

** ESBL, Extended-Spectrum Beta-Lactamases: enzymes that confer resistance to most beta-lactam antibiotics (such as penicillins and cephalosporins).*

Staphylococcus aureus

S. aureus is commonly found as a harmless coloniser in the nostrils of 30% of the healthy individuals. It is also an important cause of infections that range from localised skin and soft tissue infections (e.g. superficial wounds, boils, cellulitis, impetigo) to more deep-seated (e.g. abscesses) or generalised (e.g. bacteraemia) infections. It is the second most common cause of bloodstream infection in Ireland after *E. coli*. Meticillin-resistant *S. aureus*, or MRSA, forms a subset of all *S. aureus* isolates and may also be associated with colonisation or infection. MRSA has largely been considered a hospital problem, where infections result in longer hospital stays, more limited treatment options and higher mortality rates. MRSA is the antibiotic resistant pathogen most commonly recognised by the public and media alike as causes of healthcare-associated infections (HCAI) but there are other important pathogens to consider, some of which are examined below.

The proportion of *S. aureus* isolates associated with bacteraemia (or bloodstream infection) that are MRSA has decreased from 41.9% in 2006 to 33.7% in 2008. The downward trend has continued in 2009 and the proportion now stands at 29.0% for the first two quarters of the year (figure 1). This decline is highly significant (Chi^2_{trend}=26.2, P<0.0001). This follows a period between 2001 and 2006 when the proportion

was relatively stable at approximately 42%. Please note that the total number of *S. aureus* isolates reported increased year-on-year between 1999 and 2004 as the number of laboratories participating increased, hence the proportion of MRSA gives a better indication of the trends when looking at the entire period (for this particular dataset).

Reductions have also been seen in the rates of bacteraemia. For MRSA, the rate has decreased from 0.16 per 1,000 bed days used in 2006 to 0.14 per 1,000 bed days used in 2007 and 0.11 per 1,000 bed days used in 2008. In 2009 up to the end of Q1, the provisional rate is 0.10 per 1,000 bed days used. Please note that these rates apply to the acute public hospitals only.

In 2007, the National Hospitals Office (NHO) the Health Services Executive (HSE) set a target for a 30% reduction in MRSA infections within 5 years. Between 2006 and 2008, the total number of MRSA isolates reported to EARSS (from both public and private hospitals) decreased from 592 to 439, representing a 25% reduction.

Data on the numbers, proportions and rates of *S. aureus,* including MRSA and MSSA, for all acute public hospitals are published on HPSC's website. There is an online tool for looking at the data, including trends over time, by individual hospital. In 2010, it is planned that this will be extended to include private hospitals.

EARSS is also concerned about the emergence of resistance to glycopeptides (vancomycin and teicoplanin) amongst MRSA isolates as these antibiotics are the drugs of choice for the treatment of serious infections due to MRSA. Vancomycin-intermediate resistance (VISA) as first detected in Japan in 1997 (due to a thickening of the cell wall thus preventing the antibiotic from reaching its active site on the organism) while full resistance to vancomycin (VRSA) was first reported from the US in 2002 (due to the transfer of a vancomycin resistance gene from a strain of *E. faecium* colonising the patient). Fortunately, VRSA strains have proved to be very unstable and no person-to-person transmission has been demonstrated so far. To date, only three VISA isolates and no VRSA have been reported in Ireland. On-going surveillance for VISA and VRSA is essential and this is undertaken for all EARSS isolates submitted by the National MRSA Reference Laboratory in St James's Hospital, Dublin.

For the latest *S. aureus* and MRSA data and trends, including quarterly reports, data by individual acute public hospital and the online tool mentioned above, click here.

Despite the reductions seen in the numbers and proportions of MRSA, Ireland still had one of the highest proportions of MRSA in Europe in 2008 (see Figure 2). Similar decreases have been observed in other high incidence countries, for example, the MRSA proportion in the UK dropped from 35.6% in 2007 to 30.7% in 2008. This mirrors a recent report from the Health Protection Agency (HPA) which showed that there was a 34% fall in the numbers of MRSA bloodstream infections between 2007/08 (n=4,451) and 2008/09 (n=2,933). A number of other countries, including those with low (e.g. Norway), medium (e.g. Germany) and high (e.g. Portugal) incidences have reported increases in their MRSA proportions.

The total number of meticillin-susceptible *S. aureus* (MSSA) bacteraemia reports remained at similar levels between 2007 and 2008, perhaps best illustrated by the rate which was 0.22 per 1,000 bed days used for both years (acute public hospitals only), despite the control measures that have been put in place. This highlights that different factors may be at play beyond those required for the control of MRSA. Greater participation of laboratories in enhanced bacteraemia surveillance would go some way to elucidate the key risk factors for acquisition and infection by MSSA strains, thereby allowing appropriate measures to be implemented to help reduce the burden of infection associated with these organisms. One key factor at play is that MRSA is clonal (i.e. one or two strains may be responsible for the majority of infections in a healthcare setting) while MSSA is much more heterogeneous in nature (i.e. many different strains are present) and often acquisition is from the patient's own normal bacterial flora.

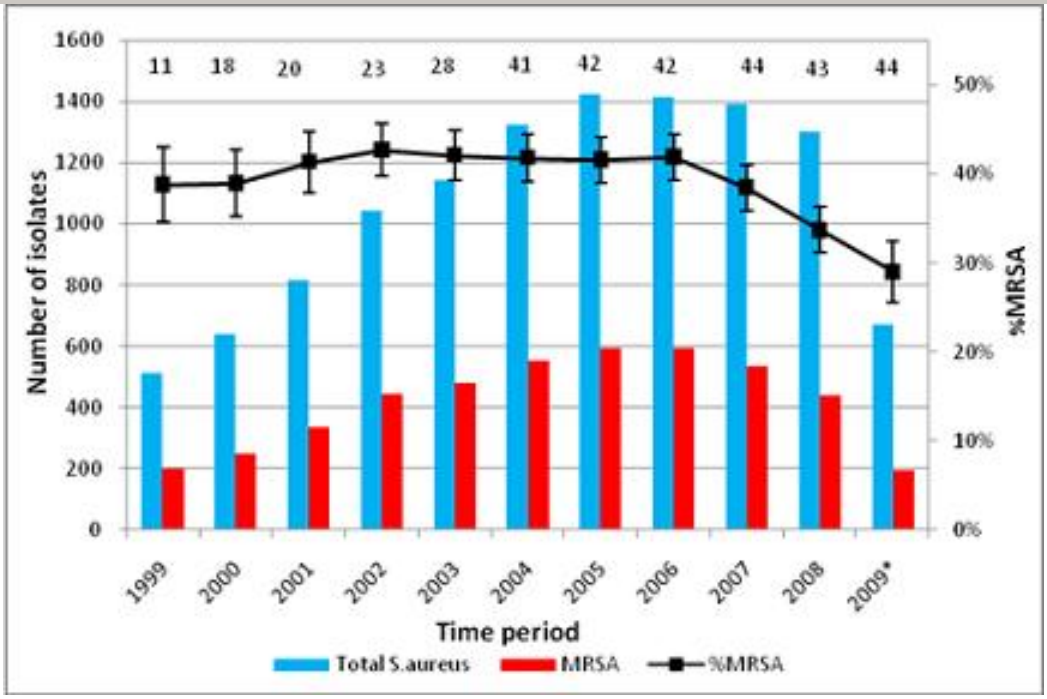

Figure 1. *Trends for S. aureus – total numbers of S. aureus/MRSA and percentage MRSA with 95% confidence intervals.*

**Data for 2009 are provisional to the end of quarter 2; the numbers of participating laboratories by year-end are indicated above the bars.*

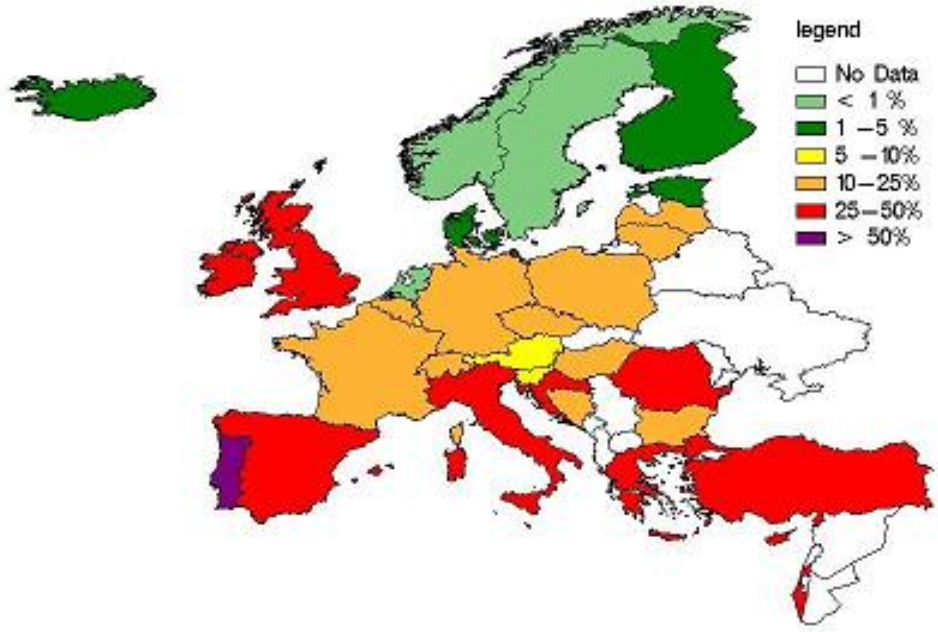

Figure 2. *Proportion of MRSA isolates in participating countries in 2008.*

Data downloaded from the EARSS interactive database http://www.rivm.nl/earss/database/ on 28th August 2009

Streptococcus pneumoniae

S. pneumoniae is a common cause of disease in young children, elderly adults and patients with a compromised immune system. The clinical spectrum ranges from otitis media and pneumonia to invasive infections including bacteraemia and meningitis.

The proportion of *S. pneumoniae* isolates associated with invasive infections that are penicillin-non-susceptible, or PNSP, increased from 11.5% in 2004 to 23.1% in 2008 (figure 3), and this increase is highly significant (Chi^2_{trend}=31.5, P<0.0001). The upward trend has continued in 2009 and the proportion now stands at 24.0% for the first two quarters of the year. Please note that the total number of *S. pneumoniae* isolates reported has increased year-on-year between 1999 and 2004 as the number of laboratories participating has increased, hence the proportion of PNSP gives a better indication of the trends when looking at the entire period (for this particular dataset). The proportion of isolates with high-level resistance (HLR) to penicillin [defined as having minimum inhibitory concentrations (MICs) of >2mg/L] almost doubled from 2.9% in 2006 to 5.7% in 2007, however this was only of borderline significance (Chi^2=3.84, P=0.05). Such isolates present greater therapeutic challenges requiring treatment with more potent, and often combinations of, antibiotics.

The rate of invasive pneumococcal disease (IPD) in Ireland in 2008 was estimated to be 10.8 per 100,000 population compared with 10.5 in 2007 (note: both calculated using the 2006 census data and adjusted for the estimated population coverage by EARSS for that year). The highest rates of IPD are observed in children <1 year (2008: 57.3 per 100,000) and older adults [2008: adults aged 75-79 years (45.4), 80-84 years (47.8) and ≥85 years (75.0)]. In the US, the estimated national incidence of invasive pneumococcal disease was 14.3 per 100,000 population in 2008 (source: Centers for Disease Suveillance.2009. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, *Streptococcus pneumoniae*, provisional-2008; available at http://www.cdc.gov/abcs/survreports/spneu08.pdf

Resistance to erythromycin amongst invasive pneumococcal isolates was 16.7% in 2008 and now stands at 21.0% for the first two quarters of 2009, which is the highest to date. As a consequence of increased PNSP and erythromycin resistance, there has been an increase in the numbers and proportions of isolates with co-resistance to both penicillin and erythromycin. Of isolates tested against both penicillin and erythromycin, 10.2% were simultaneously PNSP and erythromycin-resistant in 2008 compared with 7.9% in 2007. A similar trend has been noted in other European countries.

In 2008, moderately high levels of PNSP and erythromycin resistance were seen in Ireland, similar to the situation observed in much of Southern and Central Europe. More notably, Ireland had one of the highest proportions of HLR to penicillin (6.1%) in Europe, after Hungary (7.8%), Spain (7.1%) and France (6.6%) (figure 4). In the US, the proportion of HLR to penicillin in 2008 was 11.8% according to CDC's provisional ABCs report for *S. pneumoniae*.

The introduction of the 7-valent pneumococcal conjugate vaccine, PCV7, into the childhood immunisation program in September 2008 may go some way to reduce the burden of invasive pneumococcal disease in children less than two years and also the general population as a whole as children are known to act as reservoirs for pneumococci. A pneumococcal serotyping project has been underway since April 2007 providing valuable data on the distribution of serotypes in circulation both pre- and post- PCV7's introduction. However, on-going surveillance of the predominant serotypes is required as strains with serotypes other than those in the vaccine have been reported to increase in prevalence following introduction of PCV7 in other countries. As such it is vital that we have a fully resourced reference facility.

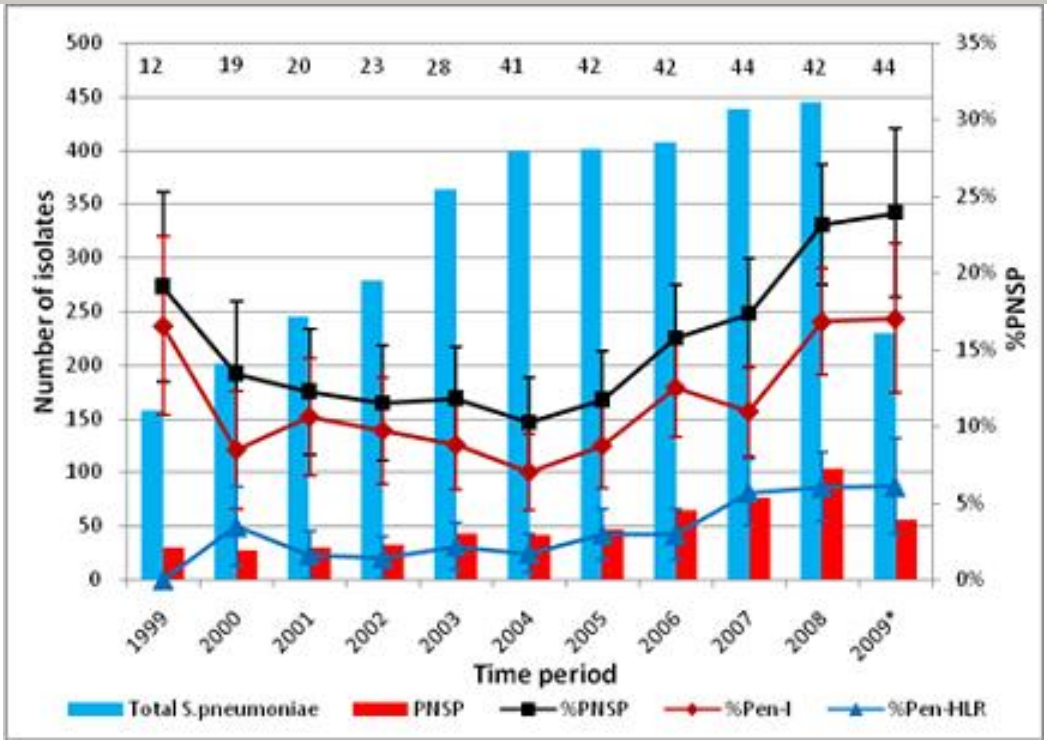

Figure 3. *Trends for S. pneumoniae – total numbers of S. pneumoniae/PNSP and percentage PNSP [penicillin-intermediate (Pen-I) and high-level resistant (Pen-HLR)] with 95% confidence intervals.*

** Data for 2009 are provisional to the end of Quarter 2; the numbers of participating laboratories by year-end are indicated above the bars*

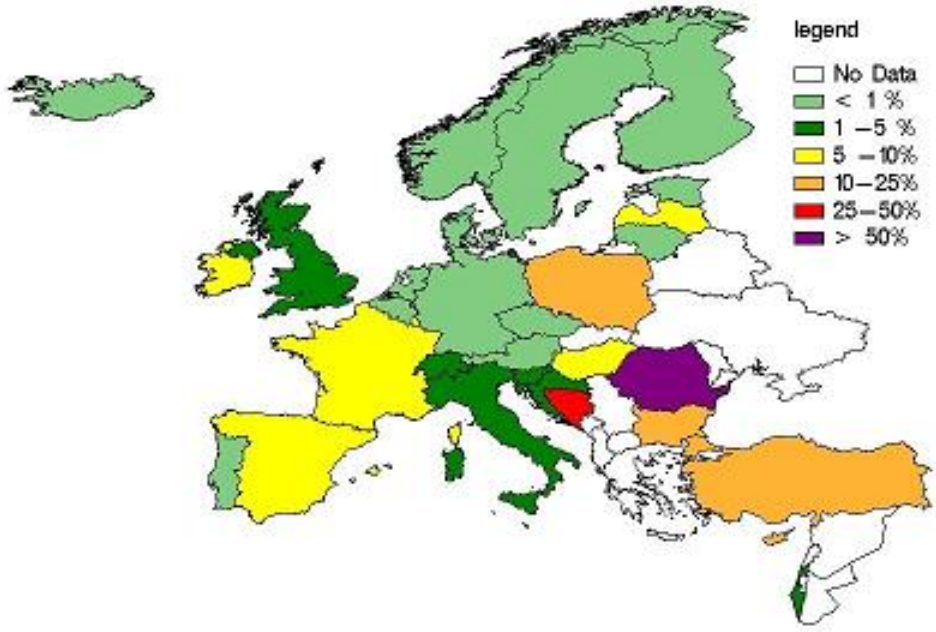

Figure 4. *Proportion of S. pneumoniae isolates with high-level resistance to penicillin in participating countries in 2008.*

Data downloaded from the EARSS interactive database http://www.rivm.nl/earss/database/ *on 28th August 2009*

Enterococcus faecalis

The enterococci are usually harmless commensal bacteria but can occasionally cause invasive disease, including bacteraemia, endocarditis and meningitis, when the bacterial-host commensal relationship is disrupted. *E. faecalis* and *E. faecium* are responsible for the vast majority of clinical infections. Usually *E. faecalis* outnumbers *E. faecium* by a ratio of 5:1. In 2007, *E. faecium* numbers overtook *E. faecalis* for the first time and the gap has been growing since then. For the first two quarters of 2009, there were almost twice as many *E. faecium* isolates as *E. faecalis*.

In 2008, vancomycin-resistant *E. faecalis* (VREfa) accounted for 3.7% of isolates. Although this proportion was low, Ireland still had one of the highest proportions of VREfa in Europe in 2008.

Enterococcus faecium

The number of *E. faecium* isolates reported increased significantly from 187 in 2004 to 406 in 2008 (table 2 and figure 5). Most notably, between 2007 and 2008 there was a 22.2% increase in numbers. In 2008, vancomycin-resistant *E. faecium* (VREfm) accounted for 35.7% of isolates. This represents only a small increase from 33.5% in 2007, however, the number of VREfm isolates increased by over 30% from 111 to 145 over the same period. Between 2002 and 2006, the proportion of isolates that was VREfm increased significantly (Chi^2_{trend}=30.0; P<0.0001) (figure 5). This provides an excellent illustration of the usefulness of rates over proportions as they give a more representative picture of the burden of infection due to VREfm that is independent of the total number of *E. faecium* isolates reported: 0.03 per 1,000 bed days used in 2007 compared to 0.04 per 1,000 bed days used in 2008, an increase of 25%. In 2008, Ireland had the highest proportion of VREfm in Europe, followed by Greece (30.7%) and the UK (29.5%) (figure 6).

Resistance to high-level gentamicin (HLG) decreased from 34.9% in 2007 to 28.1% in 2008, which was only bordering on significance (Chi^2=3.70; P=0.054). However, the downward trend since 2004 is highly significant (Chi^2_{trend}=62.1; P<0.0001) (figure 3). An increase in HLG resistance has been observed for the first two quarters of 2009.

Resistance to all three “indicator” antibiotics, or multi-drug resistance has decreased as result of the lower proportions of HLG and vancomycin resistance. Between 2007 (22.3%) and 2008 (16.2%), this decrease was of borderline significant (Chi^2=4.04; P=0.044). Figures for the first two quarters of 2009 indicate that the proportion is at a similar level to that seen in 2008, however the number of multi-drug resistant (MDR) isolates is relatively greater (61 for 2007 versus 50 for Q1-2 2009).

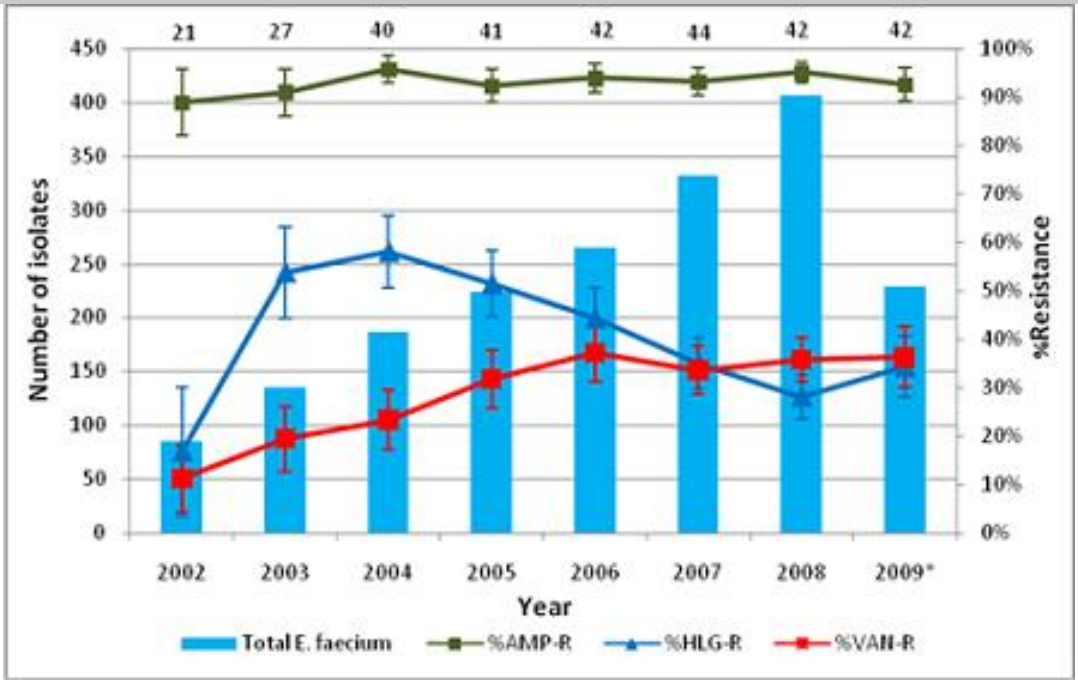

Figure 5. *Trends for E. faecium – total numbers of E. faecium and percentage resistance to ampicillin (AMP), high-level gentamicin (HLG) and vancomycin (VAN) with 95% confidence intervals*

**Data for 2009 are provisional to the end of Quarter 2; the numbers of participating laboratories by year-end are indicated above the bars*

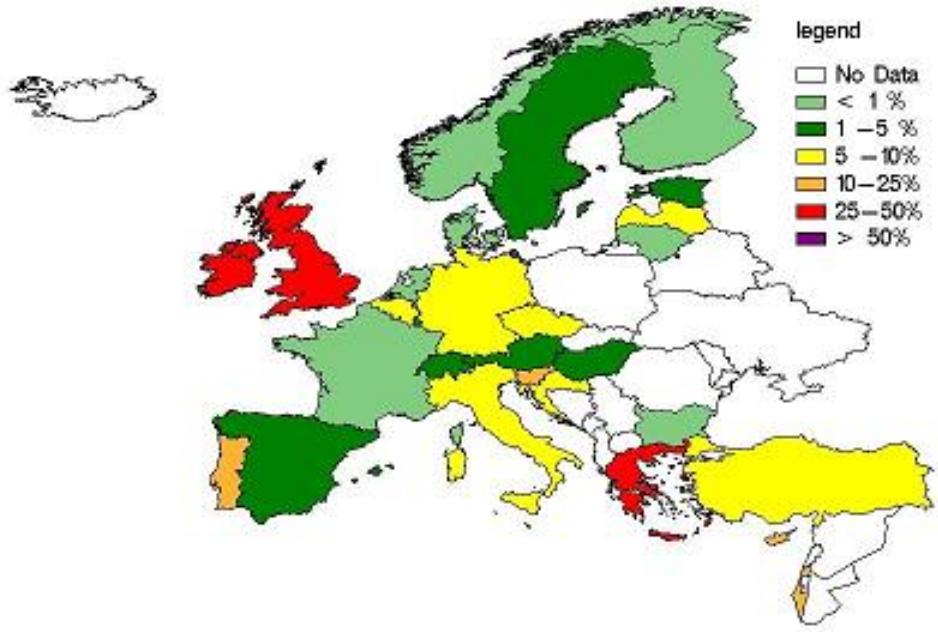

Figure 6. *Proportion of E. faecium isolates with vancomycin resistance in participating countries in 2008.*

Data downloaded from the EARSS interactive database http://www.rivm.nl/earss/database/ *on 28th August 2009*

Escherichia coli

The number of *E. coli* isolates reported in Ireland has increased significantly from 1,256 in 2004 to 1,923 in 2008 (table 1 and figure 7) to become the most common cause of bloodstream infections, having overtaken *S. aureus* as of 2005. In 2008 there was a 22.2% increase compared to 2007.

The proportion of ciprofloxacin resistant isolates increased significantly between 2002 and 2008 (Chi^2_{trend}=209.5, P<0.0001) (figure 7), although the rate of increase slowed down between 2006and 2008. The proportions of isolates with resistance to 3GCs increased from 4.2% in 2006 to 7.5% in 2008 (highly significant; Chi^2_{trend}=15.8, P<0.0001), while resistance to gentamicin increased from 7.7% to 10.2% over the same period (significant; Chi^2_{trend}=6.2, P=0.01). For the first two quarters of 2009, resistance to ciprofloxacin has decreased for the first time, while decreases have also been observed for 3GC and gentamicin resistance. Resistance to 3GCs, ciprofloxacin and gentamicin in *E. coli* isolates have been increasing throughout most of Europe in recent years. In 2008, ciprofloxacin resistance was at moderately high levels in Ireland compared to other European countries while resistance to 3GCs and gentamicin were both moderately low (figure 8).

There was a significant increase in extended spectrum beta-lactamases (ESBLs) from 2.5% in 2006 and 4.1% in 2007 (Chi^2=5.7, P=0.02), however the increase to 5.0% observed in 2008 was not significant (Chi^2=1.8, P=0.18). ESBLs are enzymes that confer resistance to most penicillins and cephalosporins (including 3GCs). ESBL-producing bacteria (including *K. pneumoniae* and, increasingly, *E. coli*) are often resistant to other classes of antibiotics and have emerged as important causes of infections in hospitals.

The proportion of isolates that are MDR (defined as resistance to three or more of the four "indicator" antibiotics) increased significantly (Chi^2_{trend}=125.3, P<0.0001) from 2.4% in 2002 to 12.1% in 2008 (figure 9). Data for the first two quarters of 2009 suggest that there is a downturn in this trend.

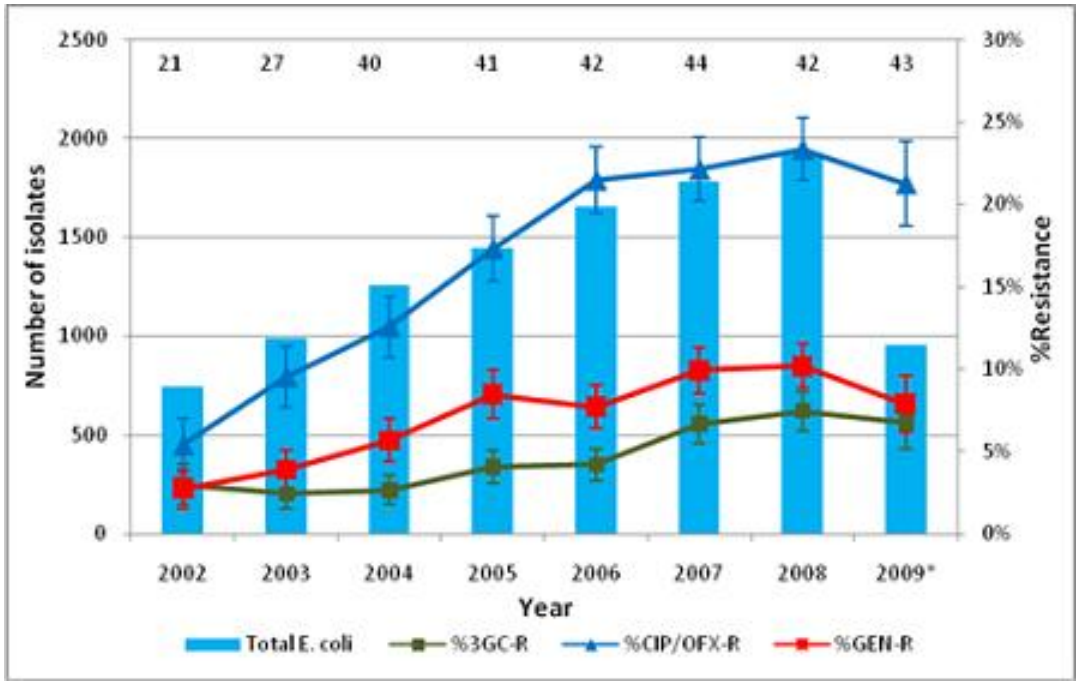

Figure 7. *Trends for E. coli – total numbers of E. coli and percentage resistance to 3GCs, ciprofloxacin/ofloxacin (CIP/OFX) and gentamicin (GEN) with 95% confidence intervals.*

** Data for 2009 are provisional to the end of Quarter 2; the numbers of participating laboratories by year-end are indicated above the bars*

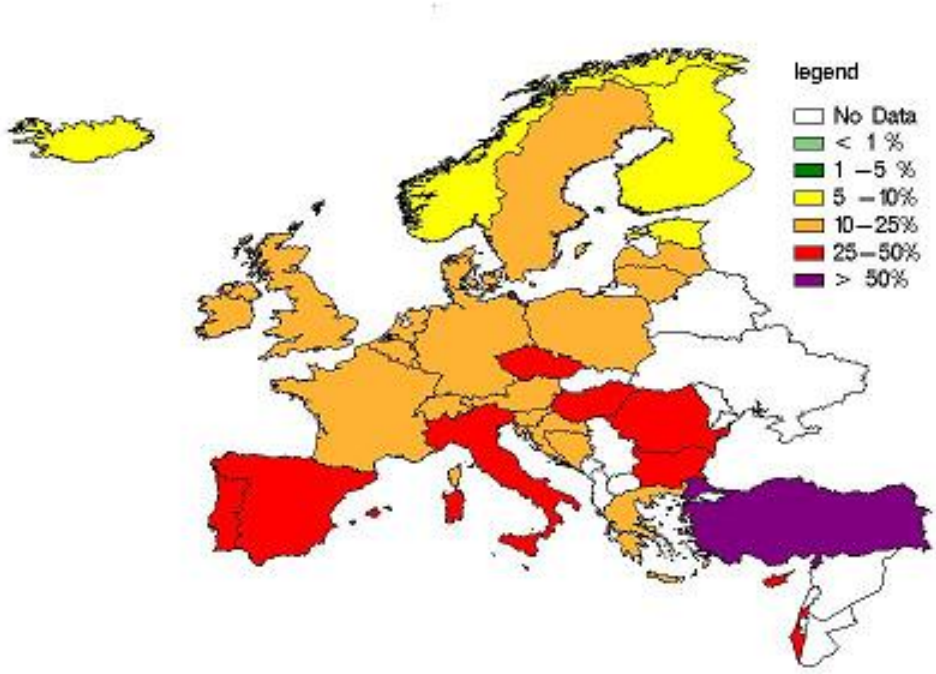

Figure 8. *Proportion of E. coli isolates with fluoroquinolone (e.g. ciprofloxacin) resistance in participating countries in 2008.*

Data downloaded from the EARSS interactive database http://www.rivm.nl/earss/database/ on 28th August 2009

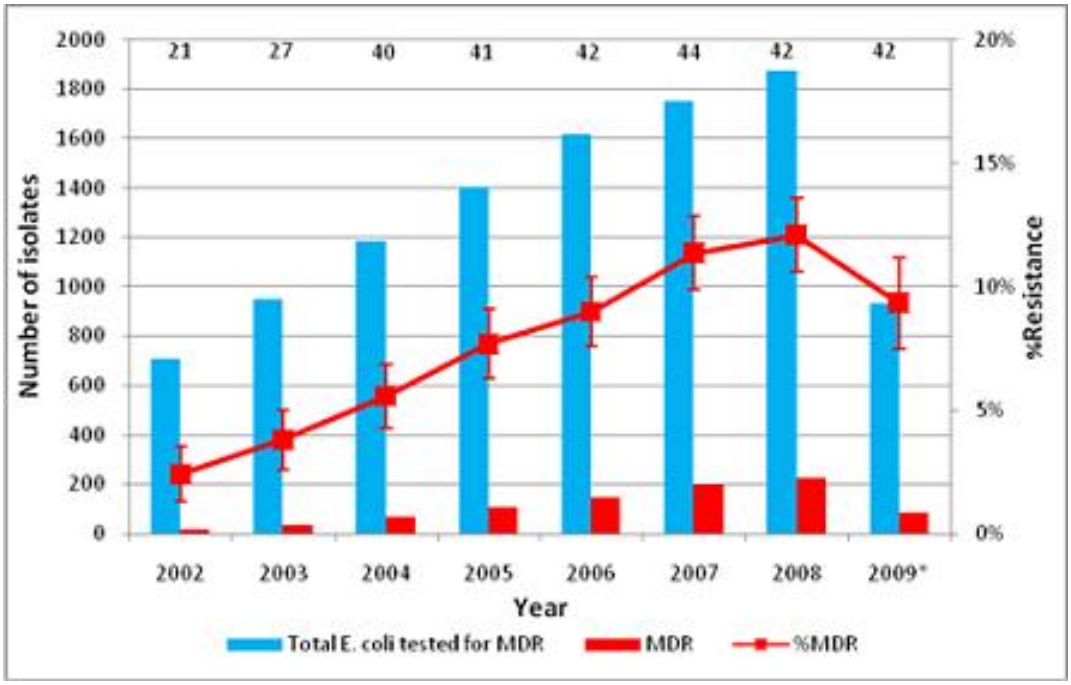

Figure 9. *Trends for Multi-Drug Resistant (MDR) E. coli – total numbers of MDR E. coli and*

percentage MDR with 95% confidence intervals.

** Data for 2009 are provisional to the end of Quarter 2; the numbers of participating laboratories by year-end are indicated above the bars*

Klebsiella pneumoniae

K. pneumoniae is the second most common cause of Gram-negative bloodstream infections in Europe after *E. coli*.

In Ireland, resistance to 3GCs has been moderately low compared with other European countries. Between 2007 and 2008, we saw a small increase from 9.9% to 11.3% in the proportion of resistant isolates, while the proportion of ESBL-producing isolates increased by over 50% from 3.7% to 7.7% over the same period (this was only borderline approaching significance due to the low numbers of isolates; Chi^2=3.39, P=0.065). For the first two quarters of 2009, 3GC-resistance and ESBL-production have decreased to 6.9% and 6.3%, respectively. ESBL-producing *K. pneumoniae* have been predominantly associated with the larger tertiary and secondary hospitals. More notably, ciprofloxacin resistance decreased from 18.1% in 2007 to 12.7% in 2008 and 9.8% for the first two quarters of 2009. Resistance to 3GCs, ciprofloxacin and gentamicin is common throughout much of central and south-eastern Europe.

Multi-drug resistance (defined as resistance to 3 or more of the "indicator" antibiotics), is another growing problem in Europe. Between 2007 and 2008, the proportion of isolates that were MDR in Ireland decreased from 11.9% to 9.9%. For the first two quarters of 2009, this has decreased further to 7.8%. This is largely due to the fall in the proportion of isolates that are ciprofloxacin resistant.

Perhaps one of the biggest threats facing us is emergence and spread of carbapenem-resistance amongst *K. pneumoniae* isolates that is, to date, largely confined to Greece, Israel and Cyprus (figure 10). This resistance is due to an enzyme called a metallo-beta-lactamase. The first isolate from an Irish hospital with this resistance mechanism was reported earlier this year from a respiratory isolate of a patient with chronic obstructive pulmonary disease (http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19163). No such resistance has been identified from those submitted to EARSS to date (one isolate with intermediate resistant to meropenem was reported in 2007 but the resistance mechanism was not determined). In 2007, 8% of *Klebsiella* isolates from healthcare-associated infections in the US were carbapenemase producers compared with <1% in 2000 and infections with these have been associated with high rates of morbidity and mortality, particularly in critically ill patients exposed to invasive devices (e.g., central venous catheters) and among persons with prolonged hospitalisation. Detection of this carbapenemase is notoriously difficult and guidelines have been developed by Clinical Laboratory Standards Institute (CLSI) to assist laboratories in their investigations, as well as recommendations by Centers for Disease Control and Prevention (CDC), Atlanta for an aggressive infection control strategy.

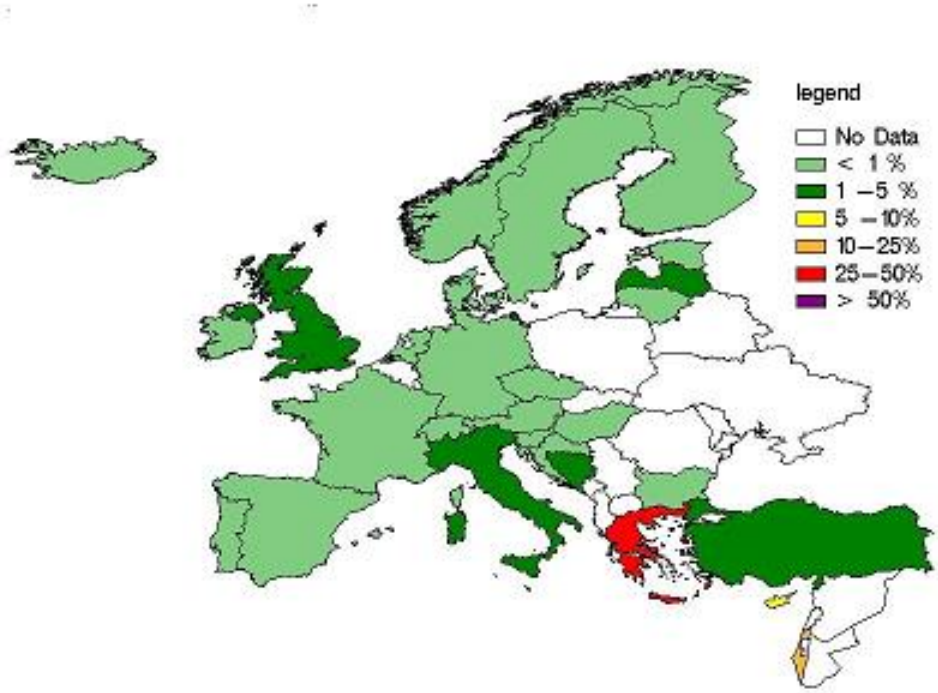

Figure 10. *Proportion of K. pneumoniae isolates with carbapenem resistance in participating countries in 2008.*

Data downloaded from the EARSS interactive database http://www.rivm.nl/earss/database/ *on 28th August 2009*

Pseudomonas aeruginosa

P. aeruginosa is an important opportunistic pathogen, especially in people with a defective immune response, e.g., in cystic fibrosis or burns patients where colonisation can lead to serious and life threatening complications.

Resistance to all "indicator" antibiotics is at low to moderate levels when compared with other countries reporting to EARSS and the resistance proportions observed in 2008 were all lower compared with the data for 2007, however, none of the differences was statistically significant.

Multi-drug resistance is regarded as the major threat imposed by invasive *P. aeruginosa* in Europe, as resistance emerges quite readily during antibiotic treatment. MDR *P. aeruginosa* has been decreasing in Ireland - from 12.5% in 2007 to 5.7% for the first two quarters of 2009.

Further developments

On-going surveillance is important to monitor trends that inform strategies for the prevention and control of antimicrobial resistance (AMR). It is vital that clinicians and laboratories be alert for the emergence and spread of antimicrobial resistance organisms from other countries, e.g. vancomycin intermediate or resistance *S. aureus* (VISA/VRSA) or carbapenemase resistant *K. pneumoniae* (KPC). To this end, reference facilities are essential and a commitment to their funding/resourcing is required. In Ireland, we currently have the National MRSA Reference Laboratory, the remit of which could ideally expand to cover other important staphylococci (MSSA and coagulase-negative staphylococci) given appropriate resources. A pneumococcal serotyping project, which is a collaboration between Royal College of Surgeons in Ireland (RCSI), The Children's University Hospital Temple Street and the HPSC, is being funded for a limited period but there is still a clear requirement for the establishment of a fully resourced reference facility, where a complete reference service can be provided, including epidemiological typing to determine the

identity of “strains” or “clones”. There are currently no reference facilities for the enterococci, *E. coli*, *K. pneumoniae* and *P. aeruginosa* or any other Gram-negative pathogen, although there are also clear needs for these facilities. Referring isolates to reference facilities overseas is expensive and loses the overall value of such a service, whereby the sum of all the isolates and data collected can be analysed to look at/ confirm the emergence of new resistances and examine trends in the predominant strains in circulation over time, as well as losing the opportunity to develop the associated clinical and laboratory expertise.

Enhanced bacteraemia surveillance of EARSS pathogens has been operating since 2004. In 2008, 13 laboratories participated in this activity but all laboratories are encouraged to join this surveillance system. The data generated from this is used by the participating laboratories to guide local control and prevention of AMR and healthcare associated infections (HCAI). It also enhances our understanding of what the specific risk factors and sources of infection are for the different pathogens in this country, especially as we look at changes in trends over time where policies have been implemented. .

New ways of presenting data are being developed, including similar online tools for the other pathogens as already published for *S. aureus*/MRSA, with *E. coli* and *E. faecium* due to be completed by the end of this year. All reports by hospital will be expanded to include data from private hospitals where agreement to do so has been reached. Further refinements to the AMR section on HPSC’s website are planned in order to make retrieval of information, data and reports by health professionals and the public alike easier. All feedback is welcome – please contact us by emailing: hpsc@hse.ie.

A lot has been achieved over the past 10 years thanks to the EARSS Network and Ireland has undoubtedly been one of the success stories with regards to its participation, with complete coverage of all laboratories and hospitals. Prior to EARSS, there was no national surveillance of AMR in this country. The Irish EARSS Network played a pivotal role in informing the Strategy for the control of Antimicrobial Resistance in Ireland (SARI) in 2001. It is vital that the momentum generated over the years is augmented by further implementation of SARI’s recommendations, especially with respect to antibiotic prescribing in hospital and community settings.

Acknowledgements

This article is dedicated to the memory of Dominic Whyte, who made a major contribution to the establishment of EARSS in Ireland from 1999 to 2001 and to making the Network the success it is today.

Finally, on behalf of everyone involved in the Irish EARSS Network, we would like to thank the many faces of the EARSS Management Team at RIVM in the Netherlands for their help and support over the years and wish the European Network further success in its new location at ECDC in Stockholm as of January 2010.

Stephen Murchan and Robert Cunney HPSC