Kent / East Sussex / South-East London Paediatric AMS Network

KESSEL-PAMS

Welcome

KESSEL-PAMS
Kent, East Surrey and South East London
Paediatric Antimicrobial Stewardship

NHS England

Day overview

KESSEL-PAMS
Kent, East Surrey and South East London Paediatric Antimicrobial Stewardship

Time	Topic	Presenter
10:00	Arrive	
10:20	Introductions and ice breakers	Jonnie Cohen, Consultant in Paediatric Infectious Diseases, Evelina Children's Hospital
10:40	What is KESSEL-PAMS network and what do we hope to achieve? Antimicrobial resistance and stewardship	Jonnie Cohen, Consultant in Paediatric Infectious Diseases, Evelina Children's Hospital Faye Chappell, Senior Pharmacist, Paediatric Infectious Diseases and South East London Formulary
11:40	Coffee break	
11:55	Why do we do what we do? Paediatric antimicrobial prescribing, tools & resources	Alison Kent, Consultant in Paediatric Infectious Diseases, Evelina Children's Hospital Sorcha McCann, Senior Pharmacist, Paediatric Infectious Diseases and BNFc
12:55	Lunch at The View, 11th Floor, Becket House	
13:45	How to make a change: baseline AMS activity & PPS QI project development	Workshop / small groups
15:00	Conclusions and next steps	Jonnie Cohen, Consultant in Paediatric Infectious Diseases, Evelina Children's Hospital

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What is KESSEL-PAMS and what do we hope to achieve?

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Kent, East Surrey and South East London
Paediatric Antimicrobial Stewardship

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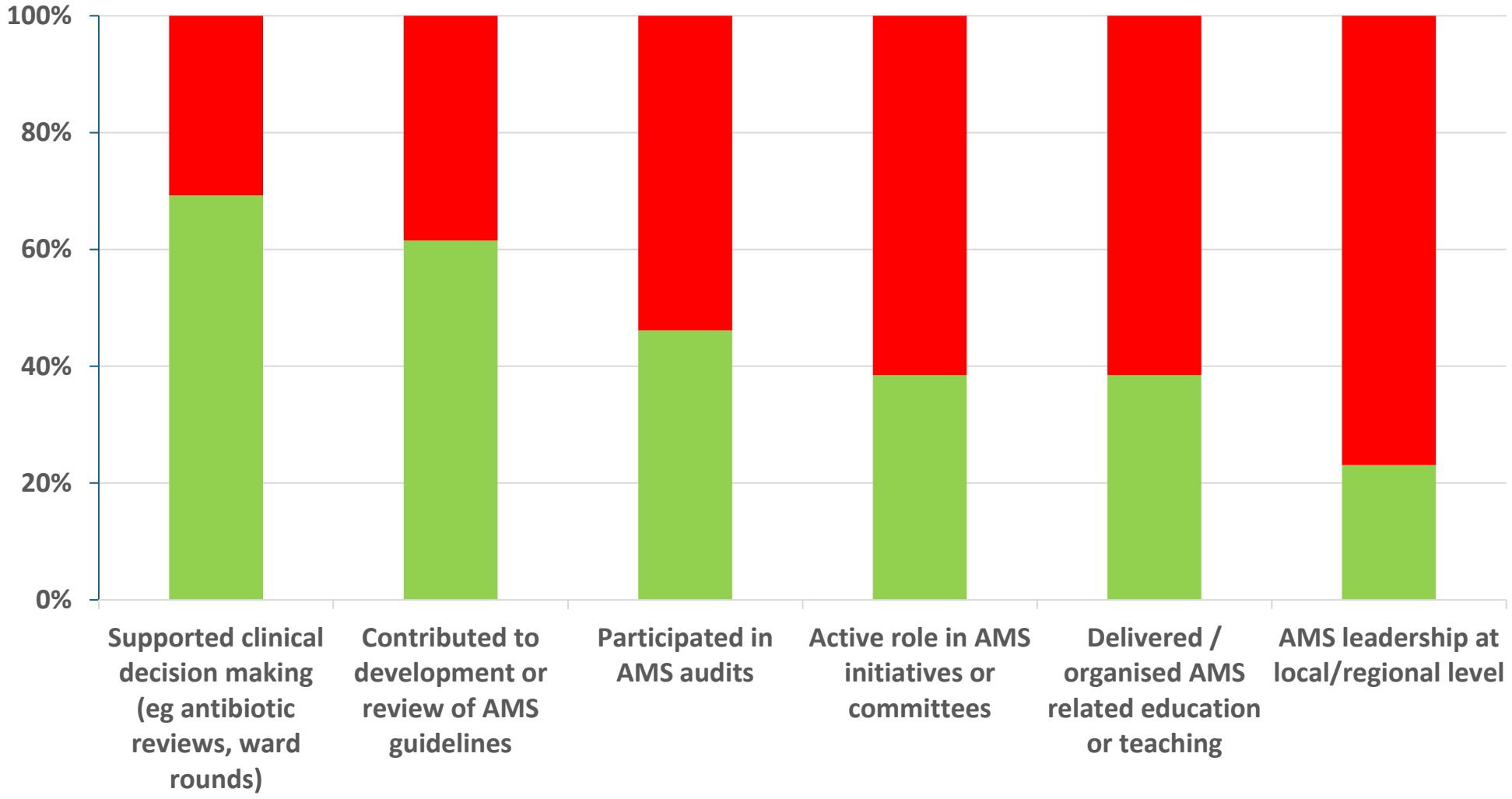
Who are we?

What is your prior AMS experience?

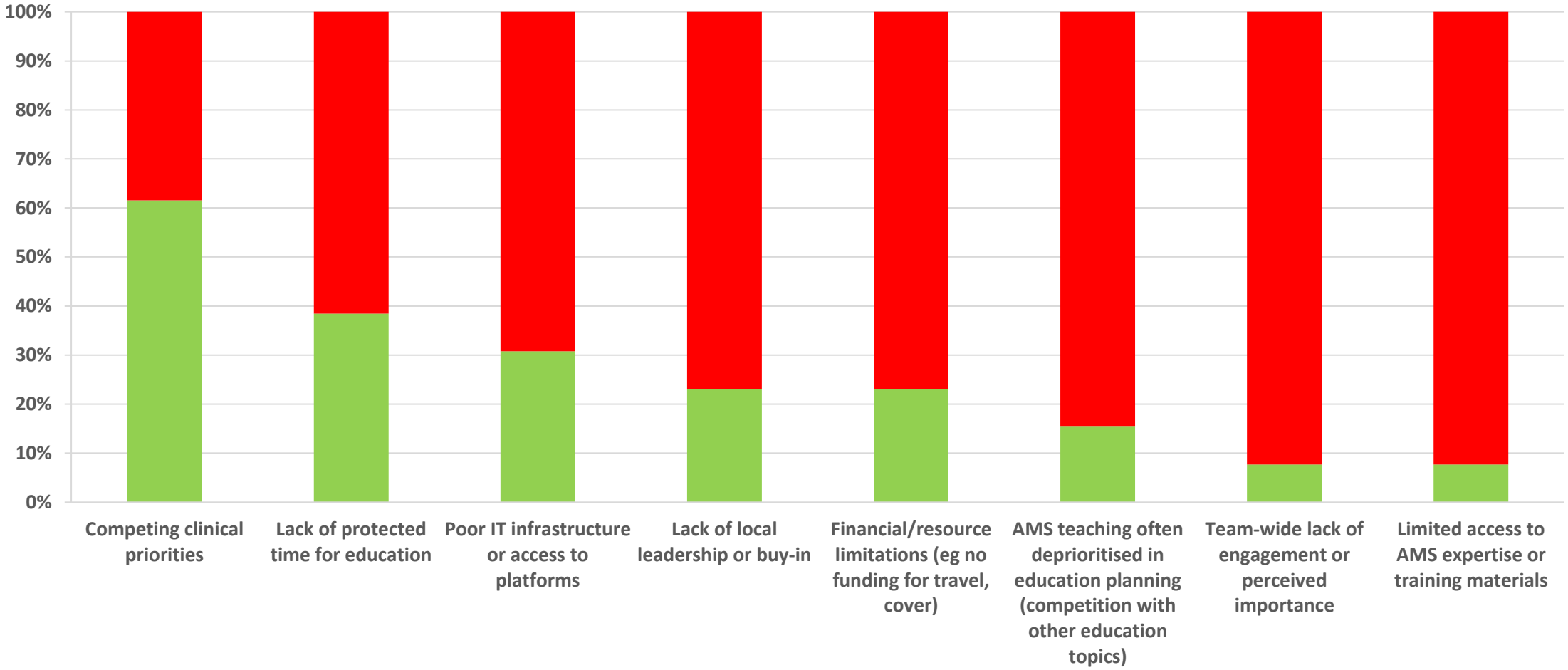
What barriers have you faced?

What do you want to prioritise?

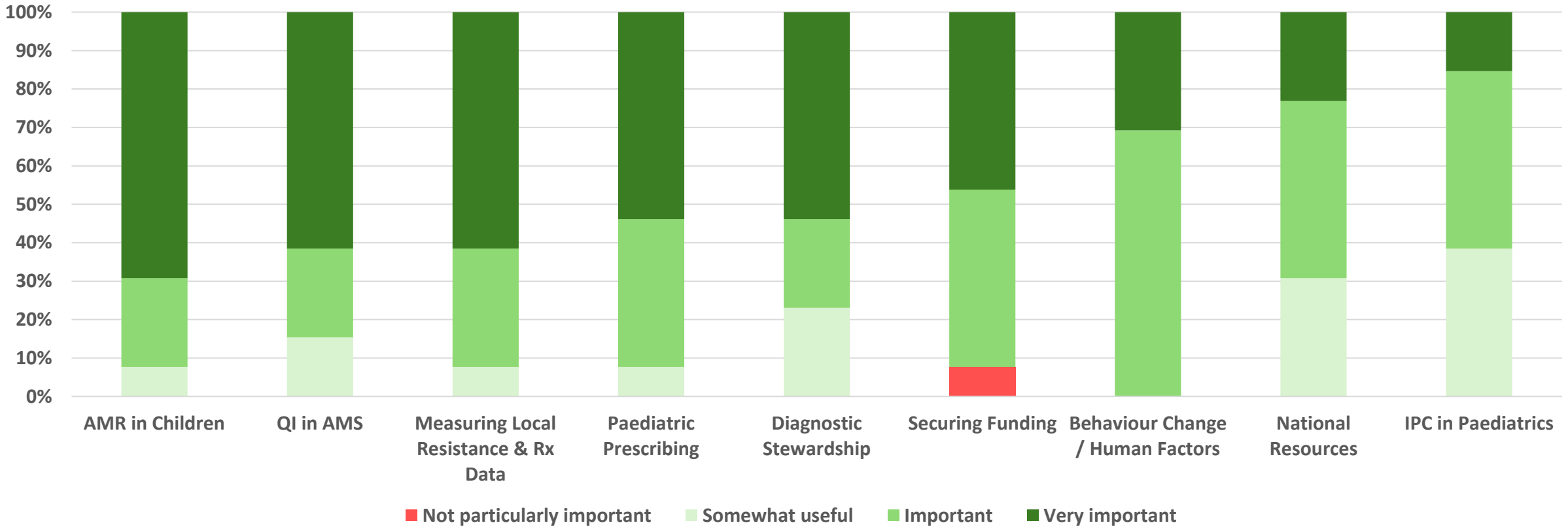
Prior AMS experience



Barriers to AMS activity



What available topics in this programme are of interest to you?



Programme Overview

What	When	How
AMR and AMS in Paediatrics	Today	F2F
Paediatric Prescribing	Today	F2F
How to make & measure change	Today	F2F
Bugs & Drugs	Late Nov	Virtual
Diagnostic Stewardship	Early Dec	Virtual
Infection Prevention & Control	Late Dec	Virtual
QI project troubleshooting 1	Late Jan	Virtual
QI project troubleshooting 2	Late Feb	Virtual
QI Project Showcase	Late Mar	F2F

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Antimicrobial Resistance and Antimicrobial Stewardship:

Think Global – Act Local

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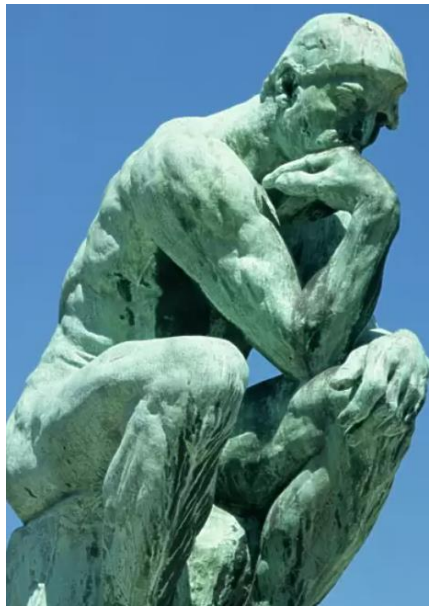
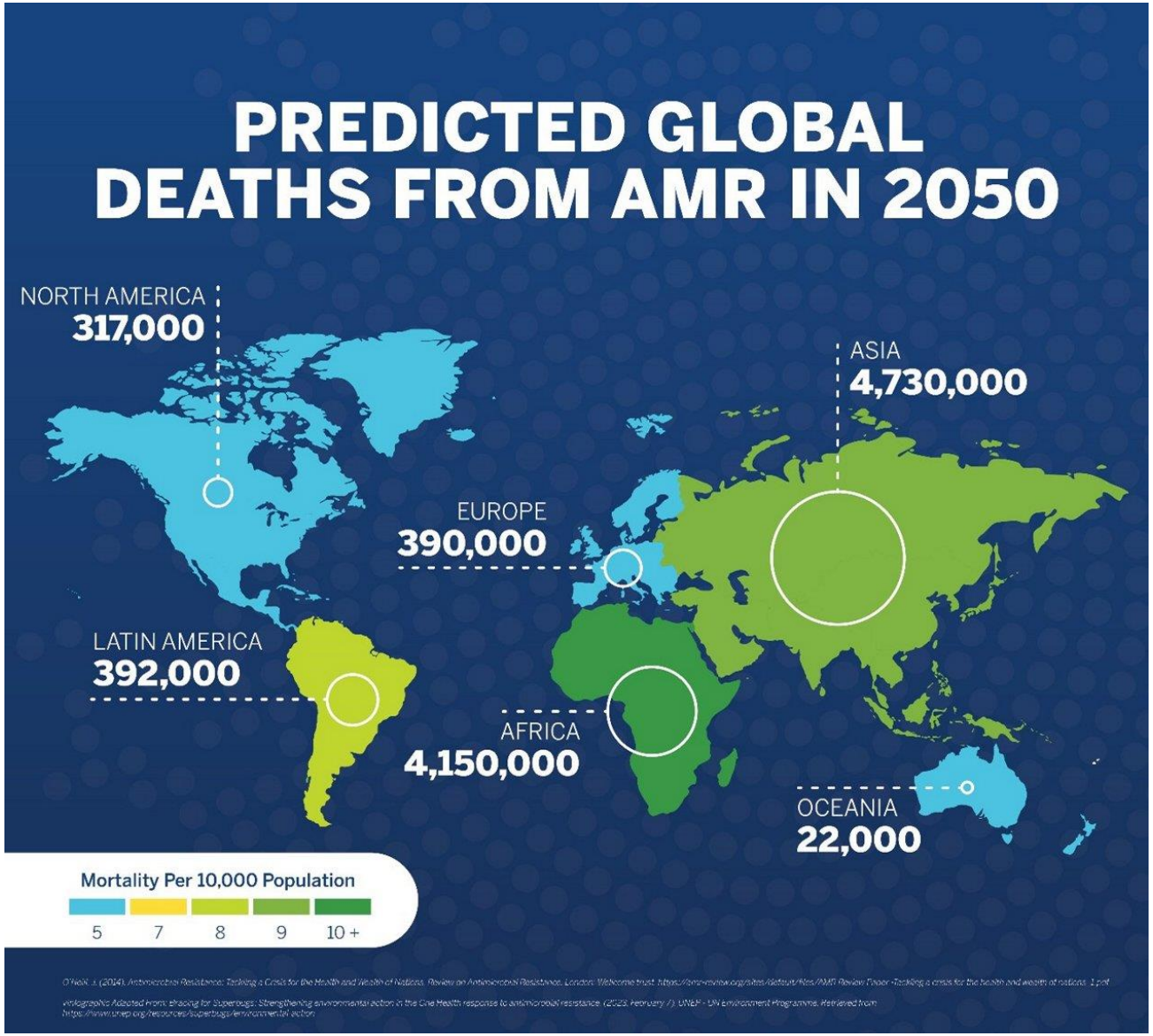


What do we know about Antimicrobial Resistance (AMR) trends?

Antimicrobial resistance is a global issue



GLOBAL A failure to address the problem of antibiotic resistance could result in:

10m deaths by 2050

Costing

£66 trillion

Antibiotic use in England

A: Percentage of carbapenem-resistant *K. pneumoniae* in 2009

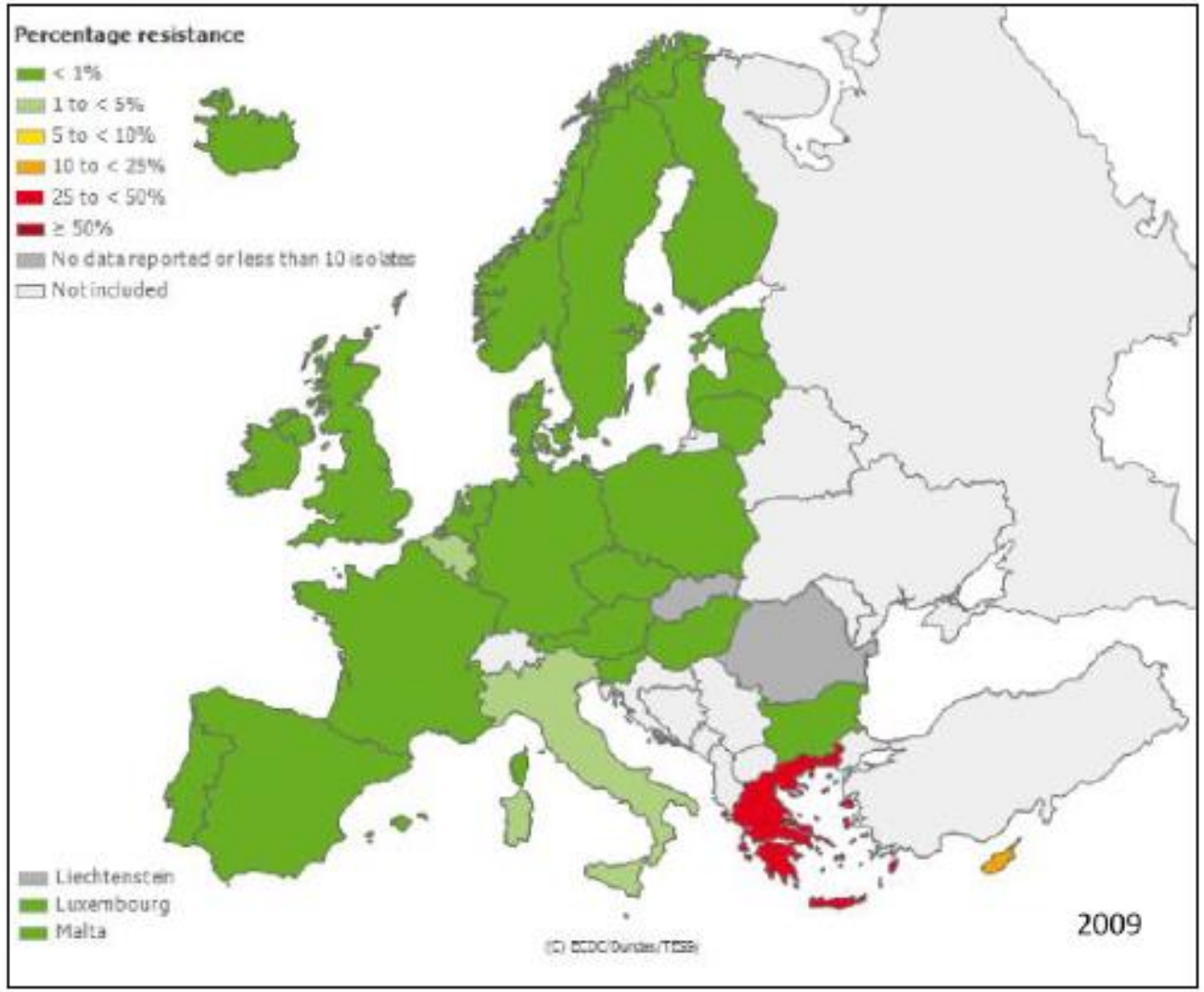


Fig. 5 *Klebsiella pneumoniae*. Percentage of invasive isolates resistant to carbapenems (imipenem/meropenem), by country, WHO European Region, 2021

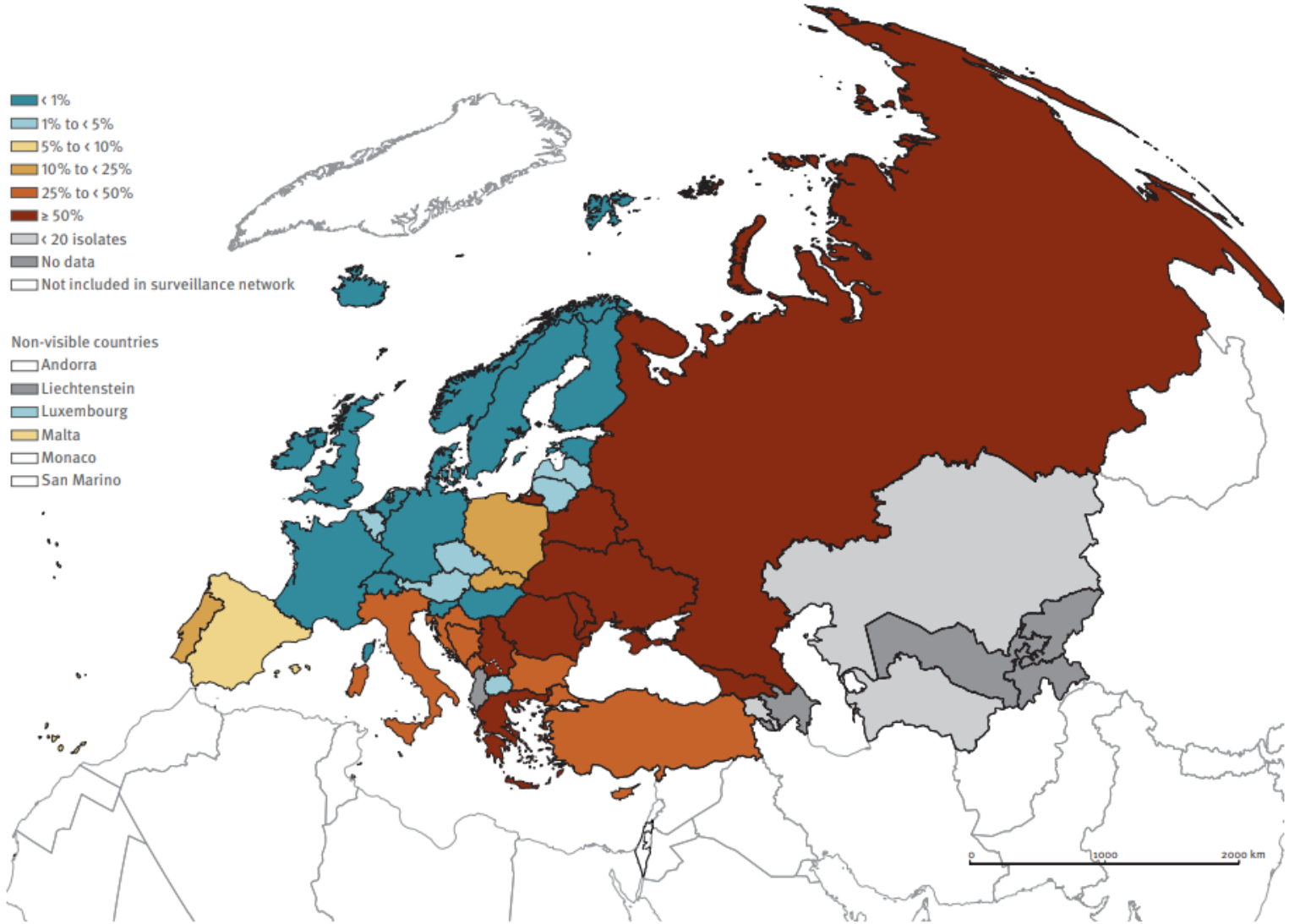
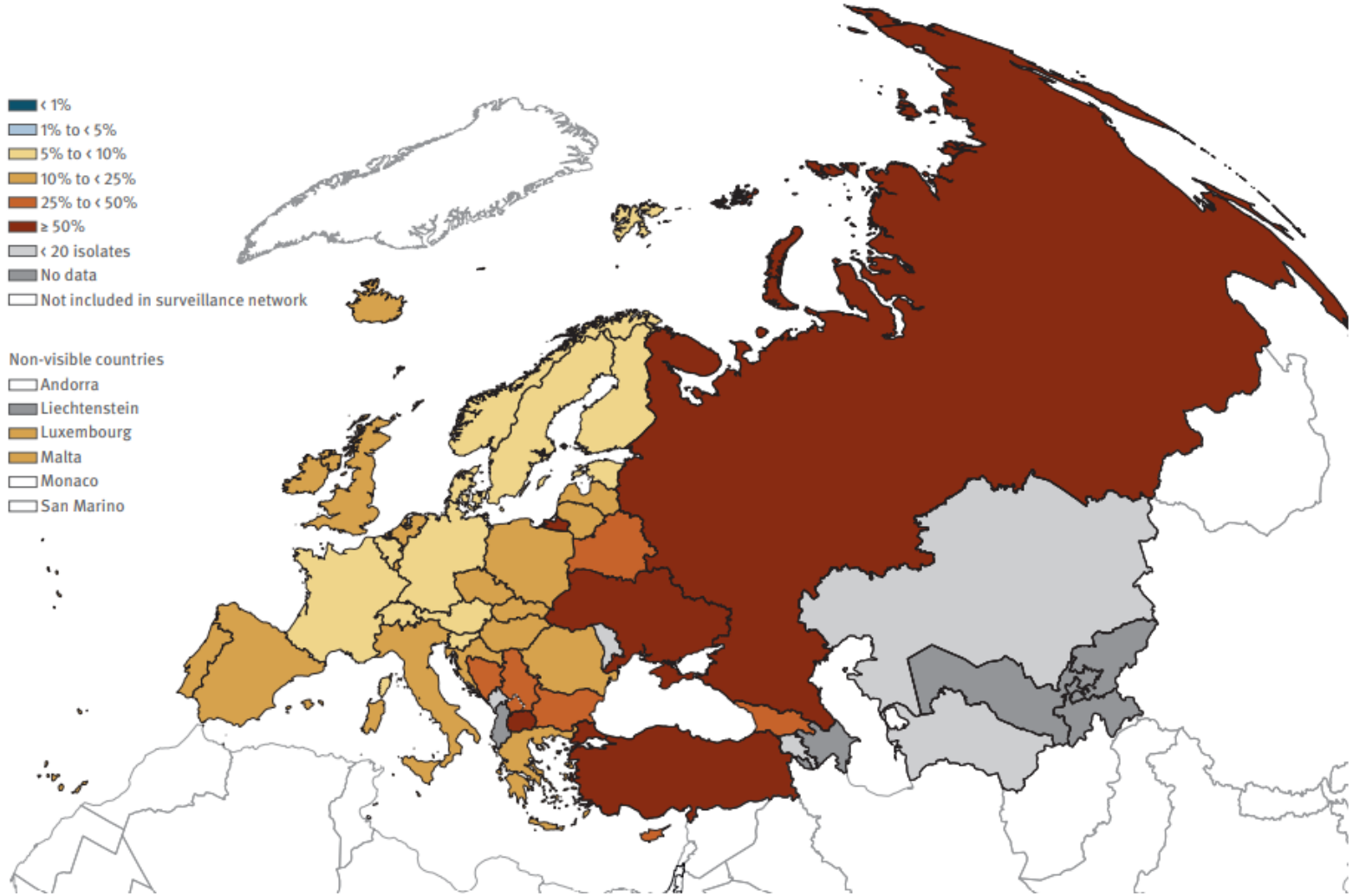
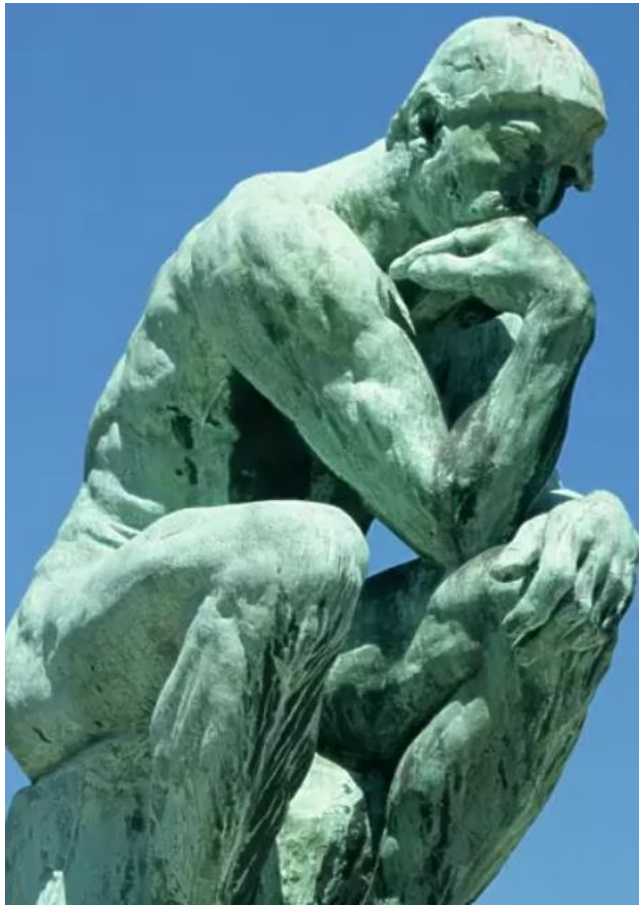


Fig. 2 ***Escherichia coli.*** **Percentage of invasive isolates resistant to third-generation cephalosporins (cefotaxime/ceftriaxone/ceftazidime), by country, WHO European Region, 2021**



Risk of Death is Higher in Patients Infected with Resistant Strains

		Deaths (%)		
	Outcome (number of studies included)	**Resistant**	**Not resistant**	**RR (95% CI)**
***Escherichia coli* resistant to:**				
3rd gen. cephalosporins	Bacterium attributable mortality (n=4)	23.6	12.6	2.02 (1.41 to 2.90)
Fluoroquinolones	Bacterium attributable mortality (n=1)	0	0	
***Klebsiella pneumoniae* resistant to:**				
3rd gen. cephalosporins	Bacterium attributable mortality (n=4)	20	10.1	1.93 (1.13 to 3.31)
Carbapenems	Bacterium attributable mortality (n=1)	27	13.6	1.98 (0.61 to 6.43)
***Staphylococcus aureus* resistant to:**				
Methicillin (MRSA)	Bacterium attributable mortality (n=46)	26.3	16.9	1.64 (1.43 to 1.87)



What do we know about AMR in children?

Paediatrics has changed significantly in the past 15-20 years

Increased survival of children with chronic health conditions, disability and life-limited illness[1]

- Survival of extremely premature babies
  - Resuscitation from 22/40 gestation in the UK[2]
- Improved supportive care including intensive care
- Increasing use of long-term ventilation[3]

1. Cass H, et al. Complexity and challenge in paediatrics: a roadmap for supporting clinical staff and families. Arch Dis Child 2020; 2. Mahase E. Consider active management for premature babies born at 22 weeks, says new guidance. BMJ 2019; 3. Wallis C et al. A national survey of paediatric long-term ventilation in the UK. Arch Dis Child 2010

Rates of AMR are similar in children to adults

Network of Australian hospitals providing data and samples of bloodstream infection (2013-16 data):

Staph aureus

- MRSA - 15% (children) versus 19% (adults)
- Bacteraemia rates 9 per 100,000/year in children versus 14 per 100,000/year in adults

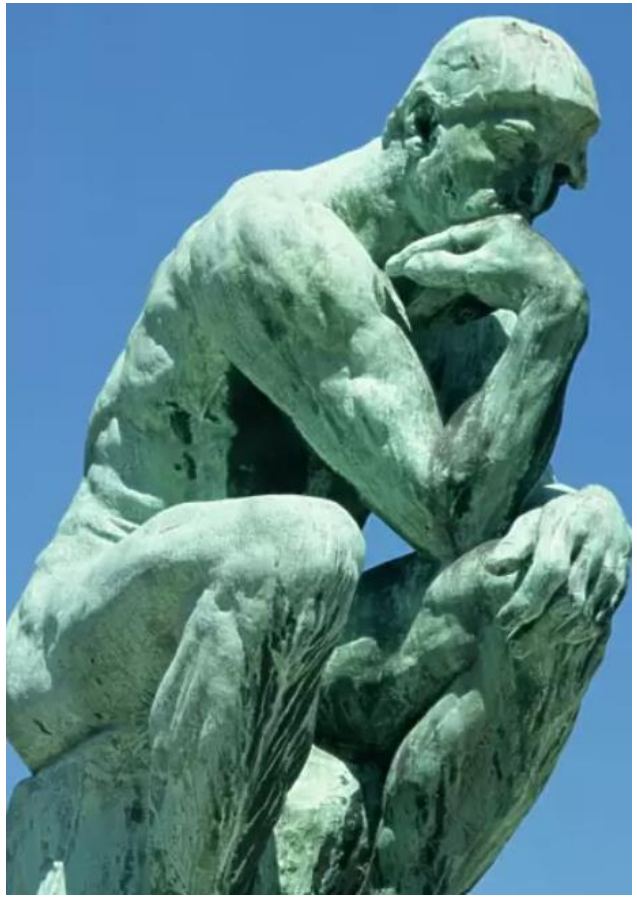
Resistant gram – ve's

- ESBL (Klebsiella) – 9% (children) versus 14% (adults)
- ESBL (E Coli) –12% (children) versus 8% (adults)
  - Bacteraemia rates 12 per 100,000/year in children versus 40 per 100,000/year in adults

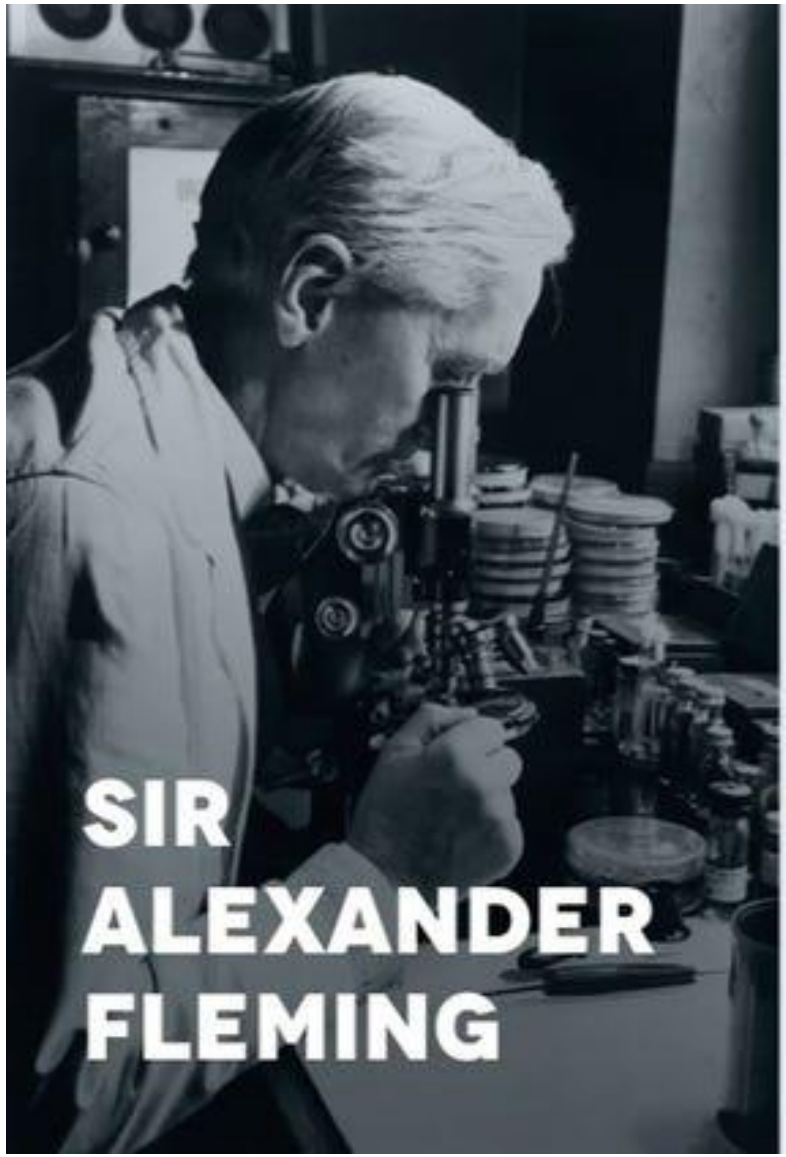
E. coli resistance rates - urine samples
Evelina London Emergency Department 2023

Amikacin	<1%
Amoxicillin	54%
Ceftazidime	11%
Cefalexin	13%
Ciprofloxacin	11%
Co-amoxiclav	39%
Gentamicin	7%
Meropenem	<1%
Nitrofurantoin	1%
Pip/taz	5%
Trimethoprim	30%

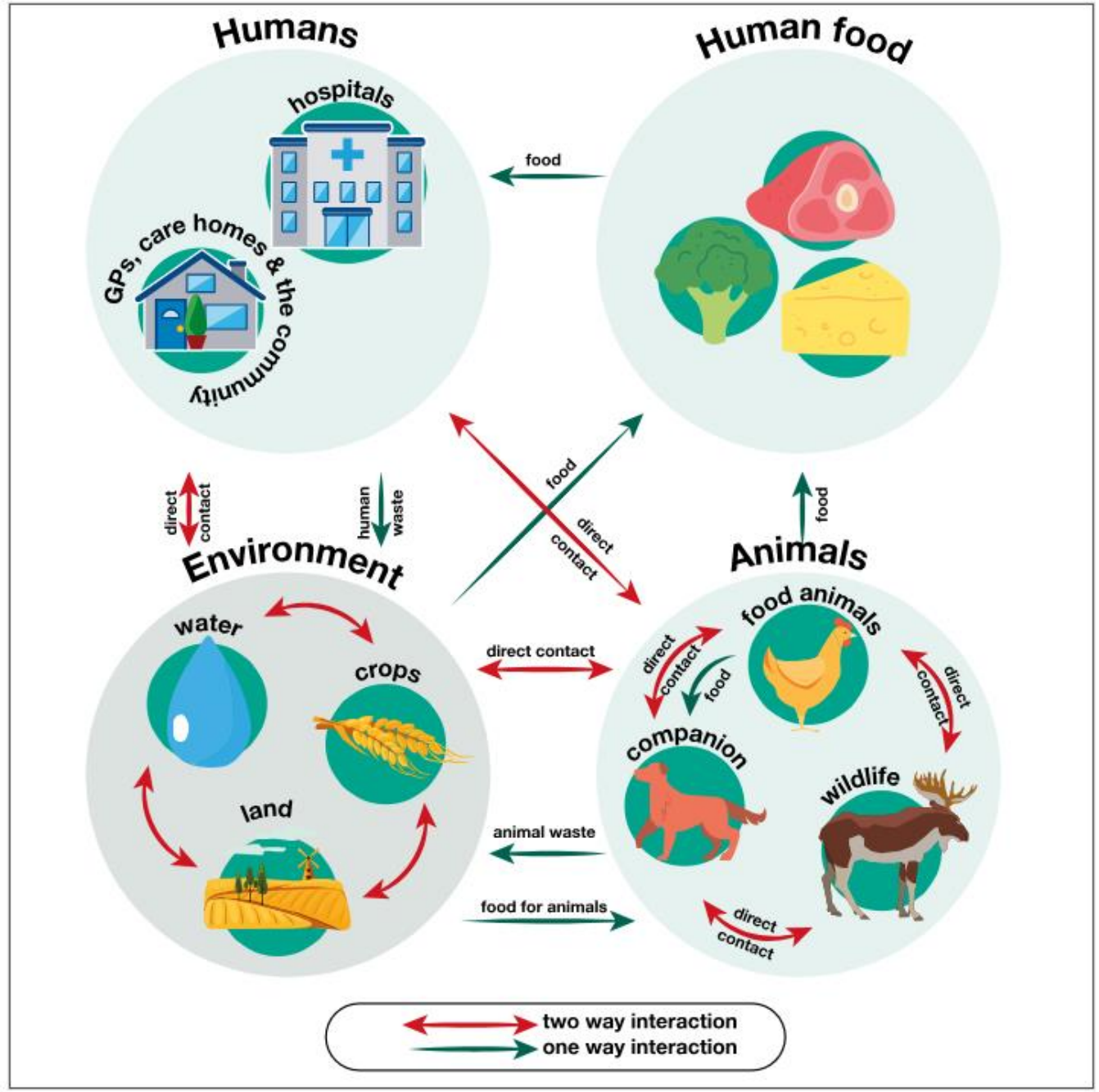
(<16yo, n=558)



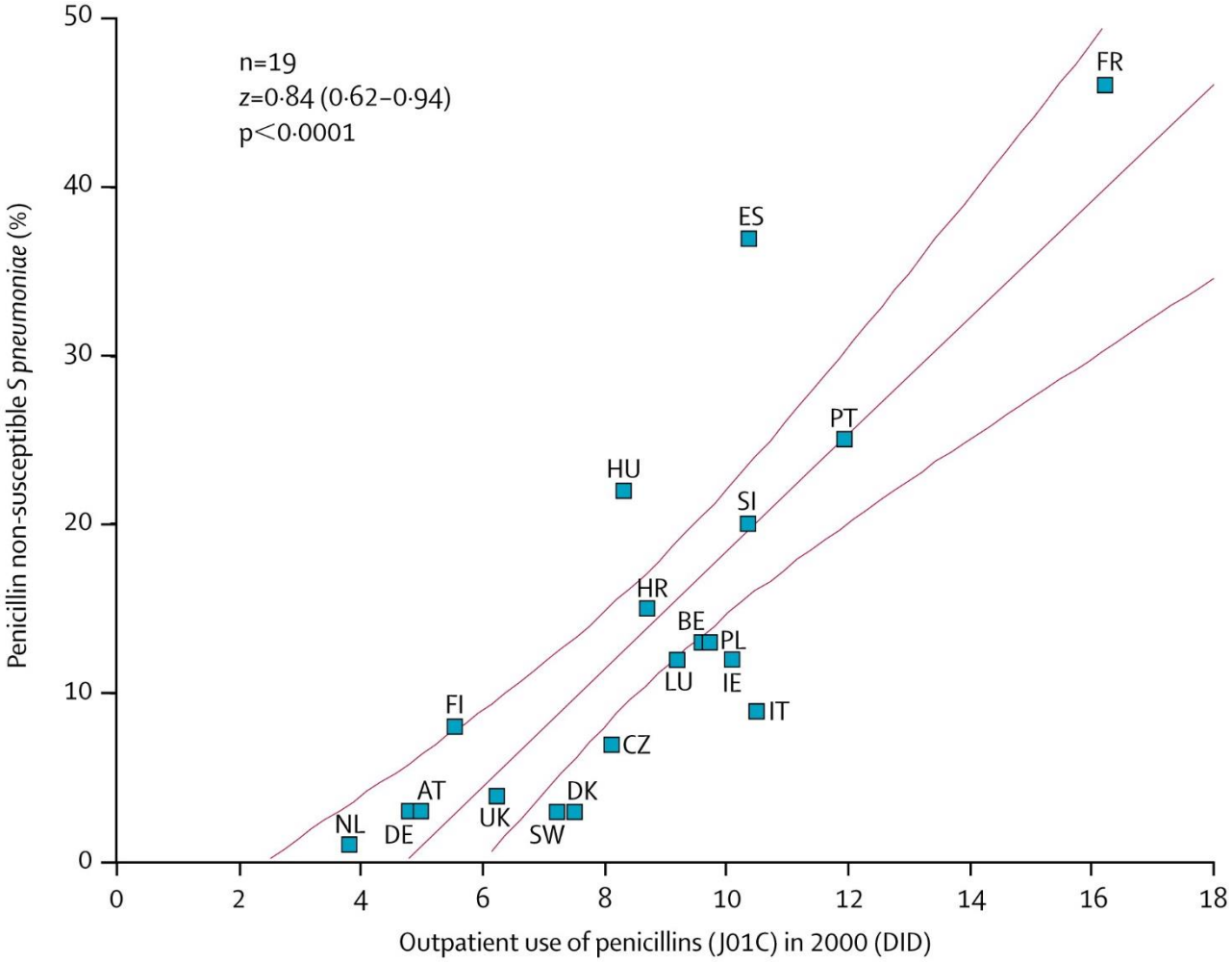
What do we know about the association between AMR and antibiotics?



The thoughtless person playing with penicillin treatment is morally responsible for the death of the man who succumbs to infection with the penicillin-resistant organism.


Humans
hospitals
GPs, care homes & the community
Human food
food
food
direct contact
human waste
direct contact
food
Environment
Animals
water
crops
land
direct contact
food animals
direct contact
food
direct contact
companion
wildlife
direct contact
animal waste
food for animals
two way interaction
one way interaction

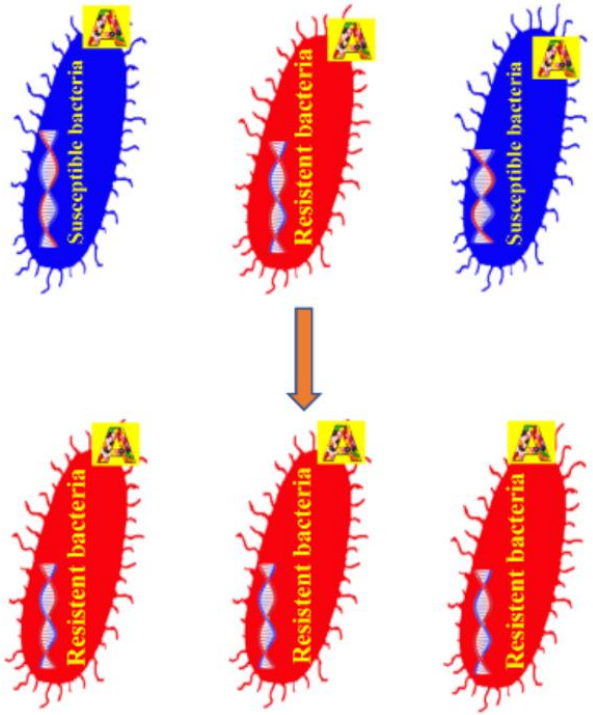
Antibiotic prescribing drives resistance

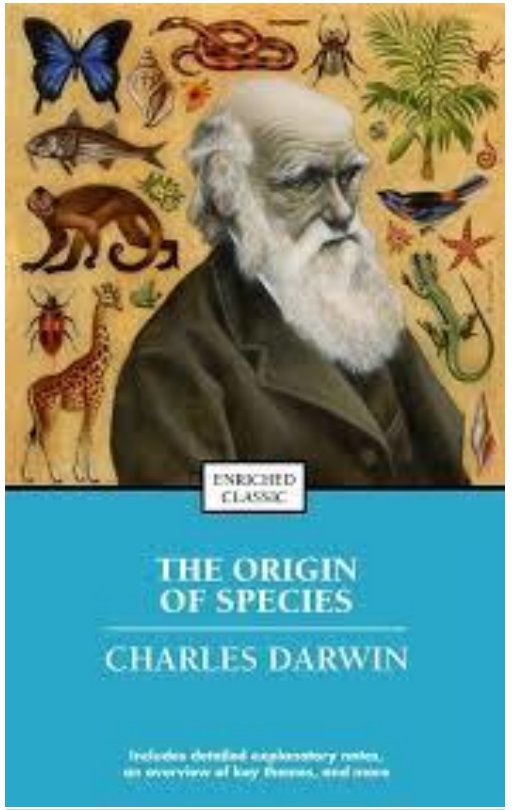


Goosens *et al*.
Lancet 2005

Exposure to antibiotics drives resistance

Mutations and selection of resistant bacteria





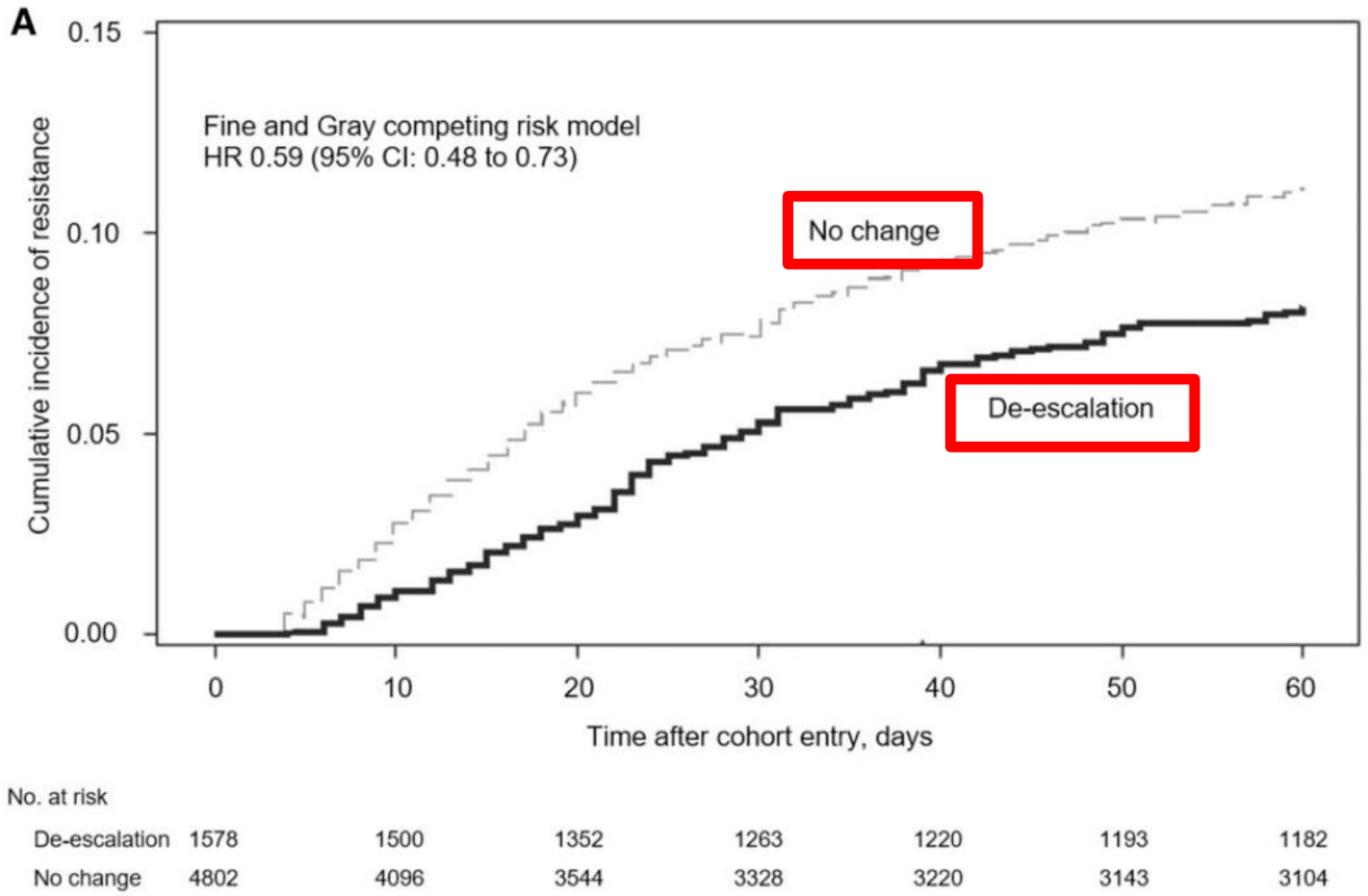
Natural selection

Use of broad spectrum β-lactam Abs drives AMR in the individual patient in real time

7742 adult patients with gram –ve sepsis recruited 2010-17 (retrospective study)

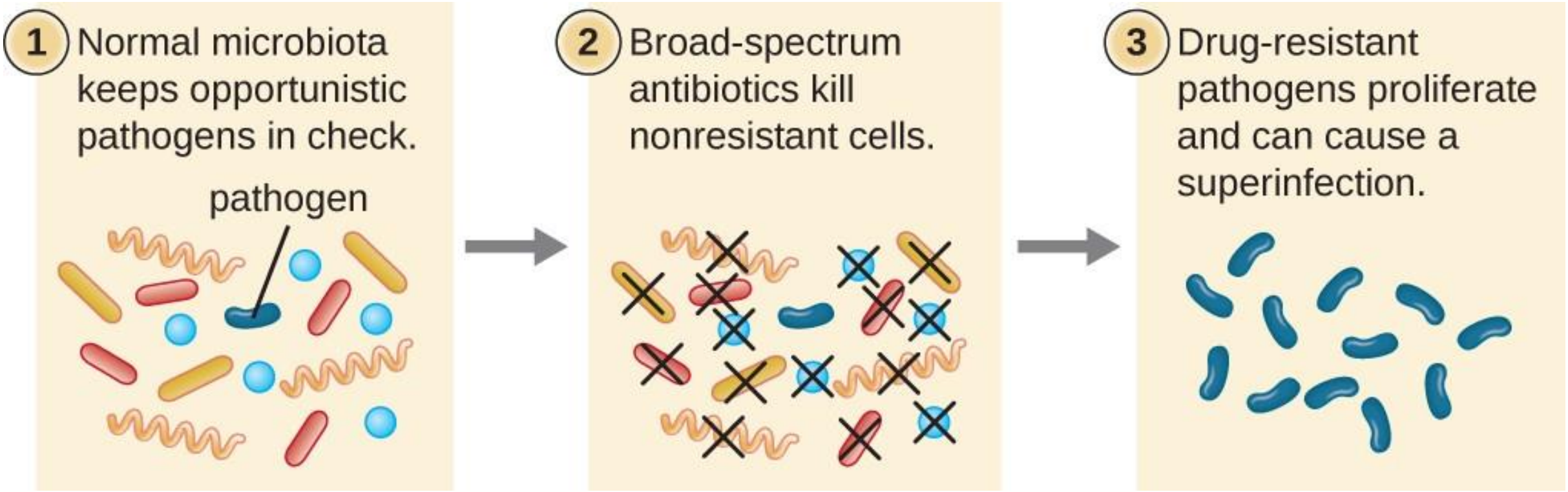
- All clinical samples from day +3 after admission reviewed
- 644 (8.3%) developed new gram –ve resistance

Teshome, B. F. at al. Preventing New Gram-negative Resistance Through Beta-lactam De-escalation in Hospitalized Patients With Sepsis: A Retrospective Cohort Study. *Clinical infectious diseases 2024*

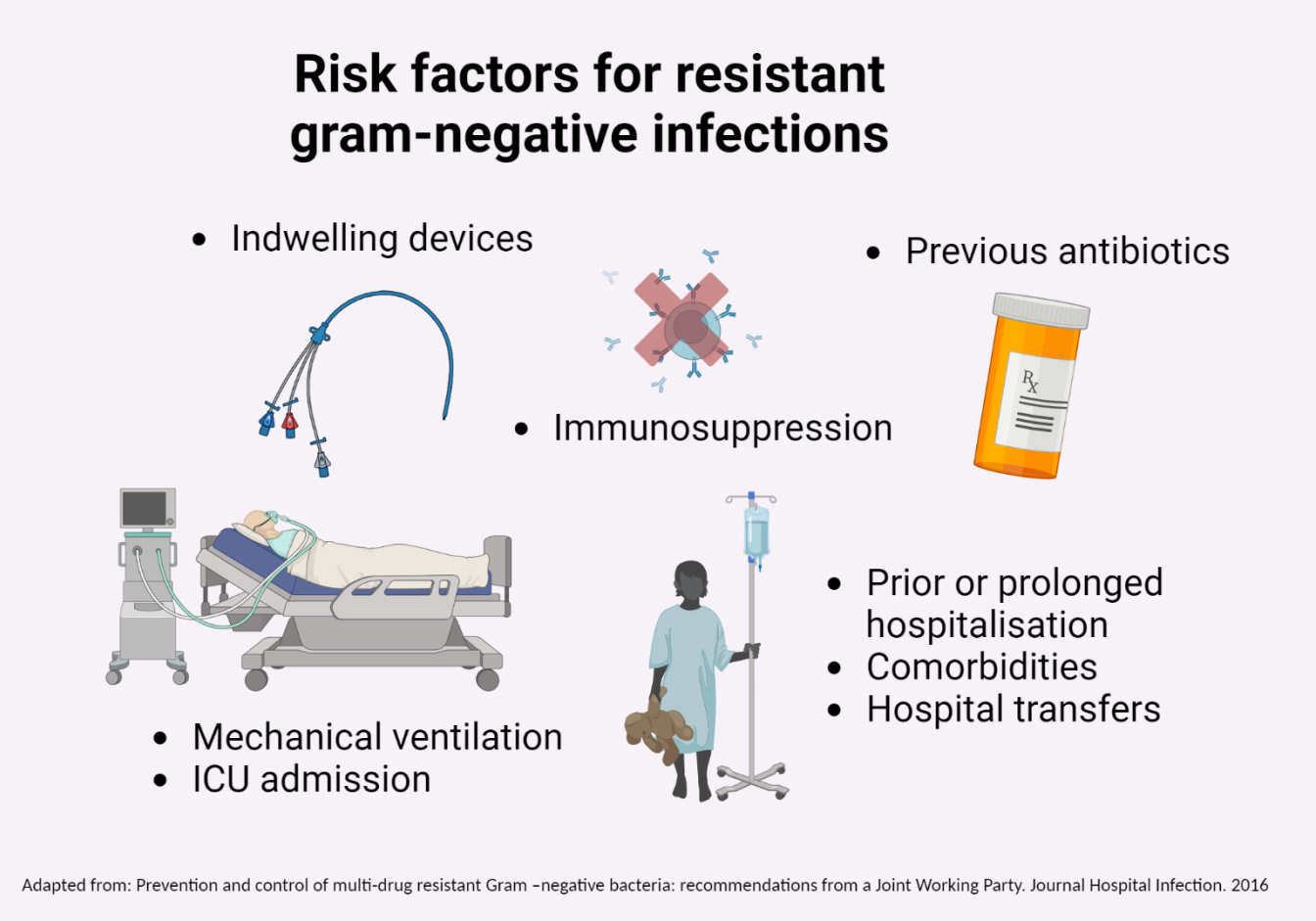


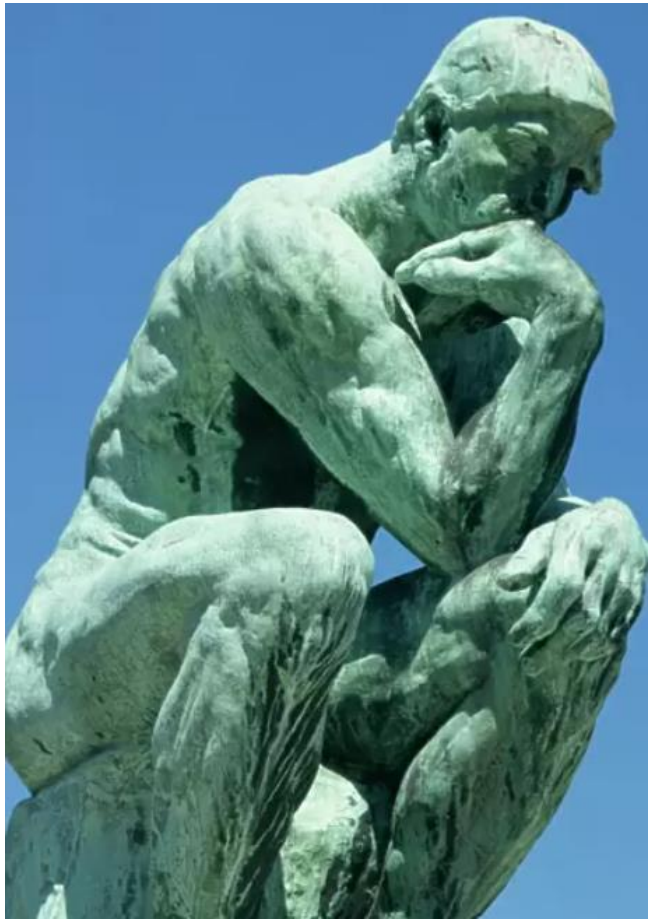
Teshome, B. F. at al. Preventing New Gram-negative Resistance Through Beta-lactam De-escalation in Hospitalized Patients With Sepsis: A Retrospective Cohort Study. *Clinical infectious diseases 2024*

Exposure to broad spectrum antibiotics increases risk of colonisation / invasive infection



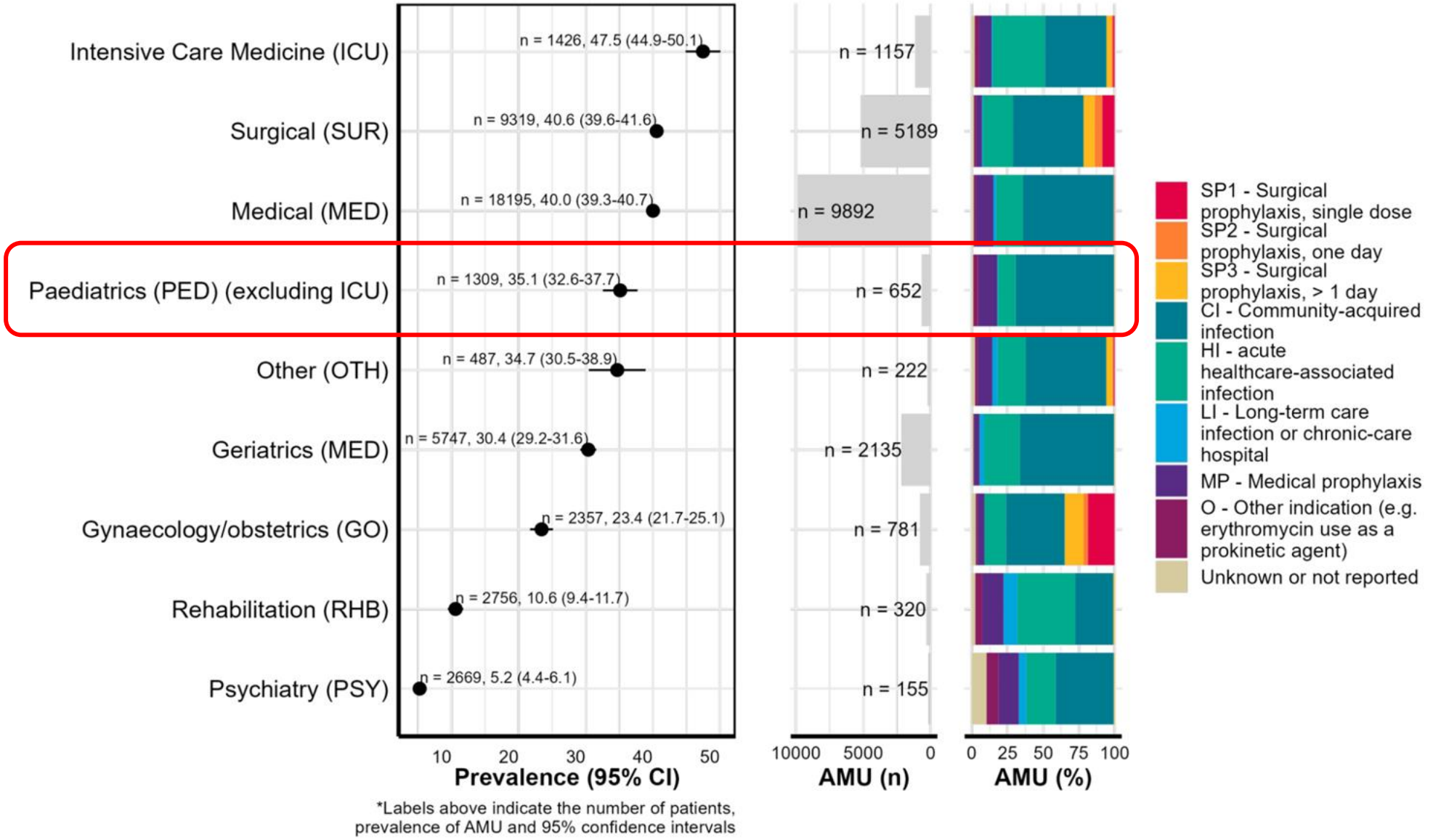
Management on PICU or NICU associated with highest risk of colonisation and highest risk of conversion from colonisation to infection





What do we know about antibiotic use in children?

Figure 3.3.1.6. Prevalence of antimicrobial use per patient speciality and indication for antimicrobial use, PPS England 2023



*Labels above indicate the number of patients, prevalence of AMU and 95% confidence intervals

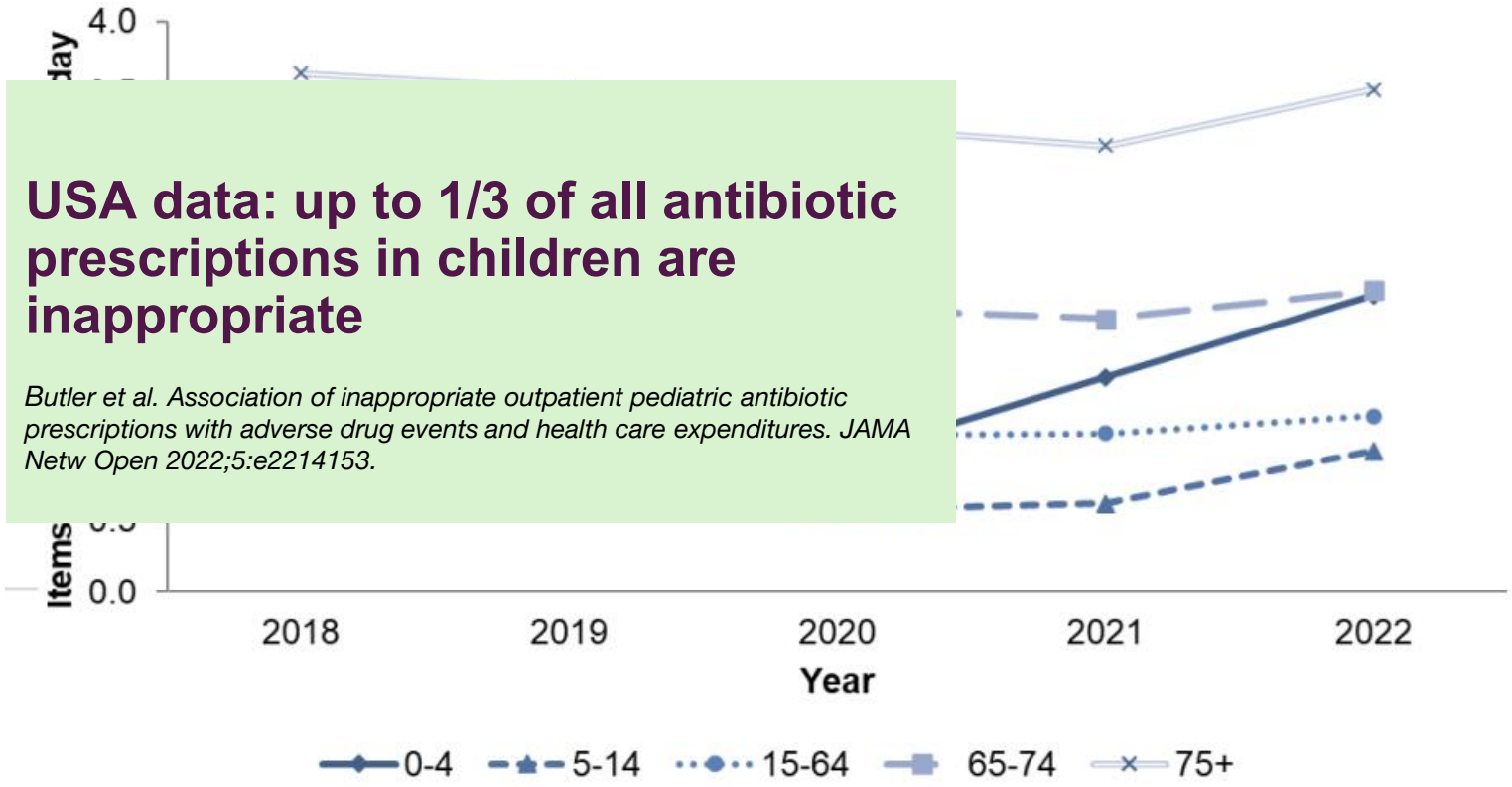
35% paediatric inpatients on antibiotics

UK HSA PPS (AMS and HCAI 2023)

NHSBSA ePACT2 Antimicrobial Stewardship – Children's dashboard: England, Financial Year 2022-2023

USA data: up to 1/3 of all antibiotic prescriptions in children are inappropriate

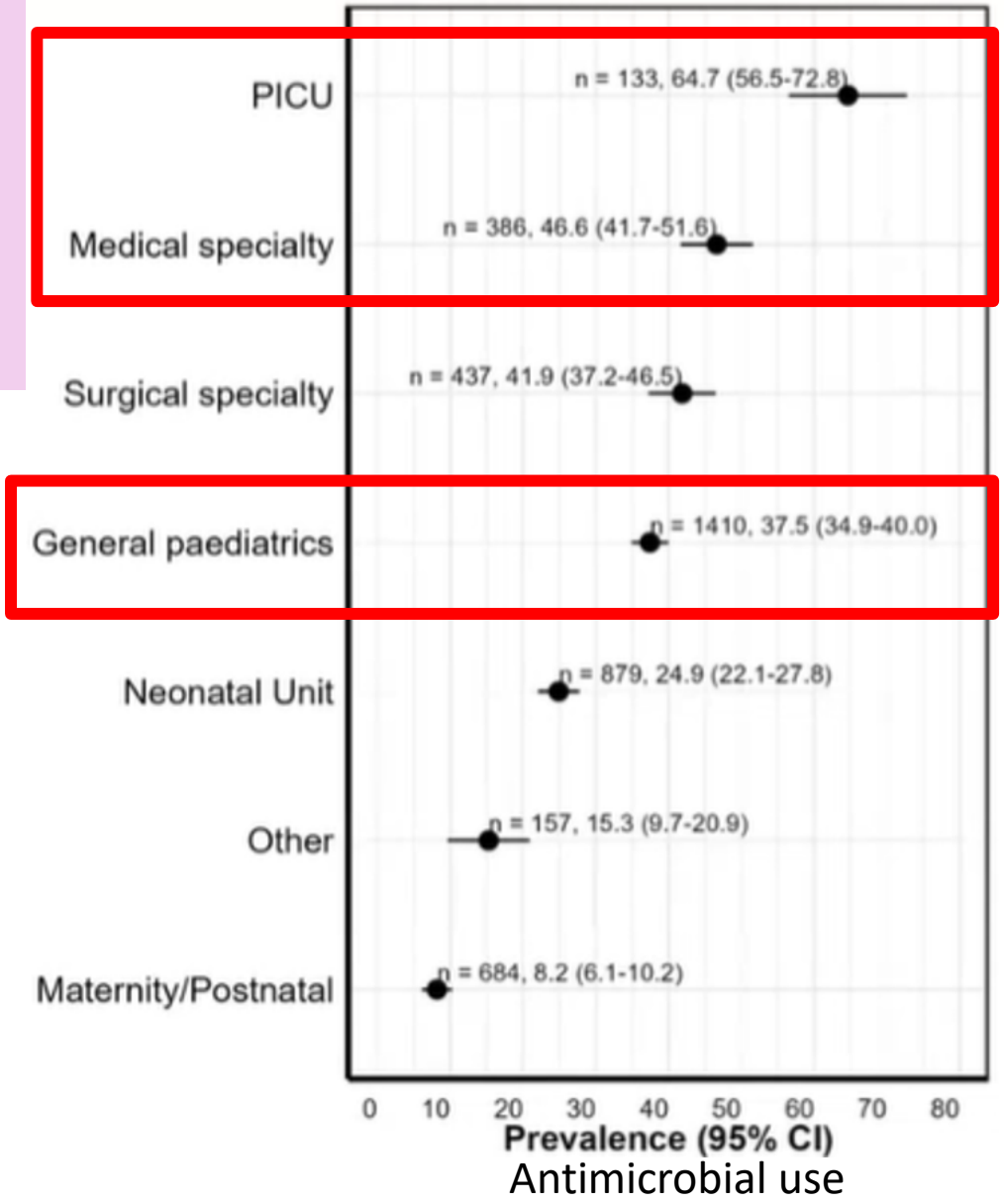
Butler et al. Association of inappropriate outpatient pediatric antibiotic prescriptions with adverse drug events and health care expenditures. JAMA Netw Open 2022;5:e2214153.



UKHSA ESPAUR Report 2022-23

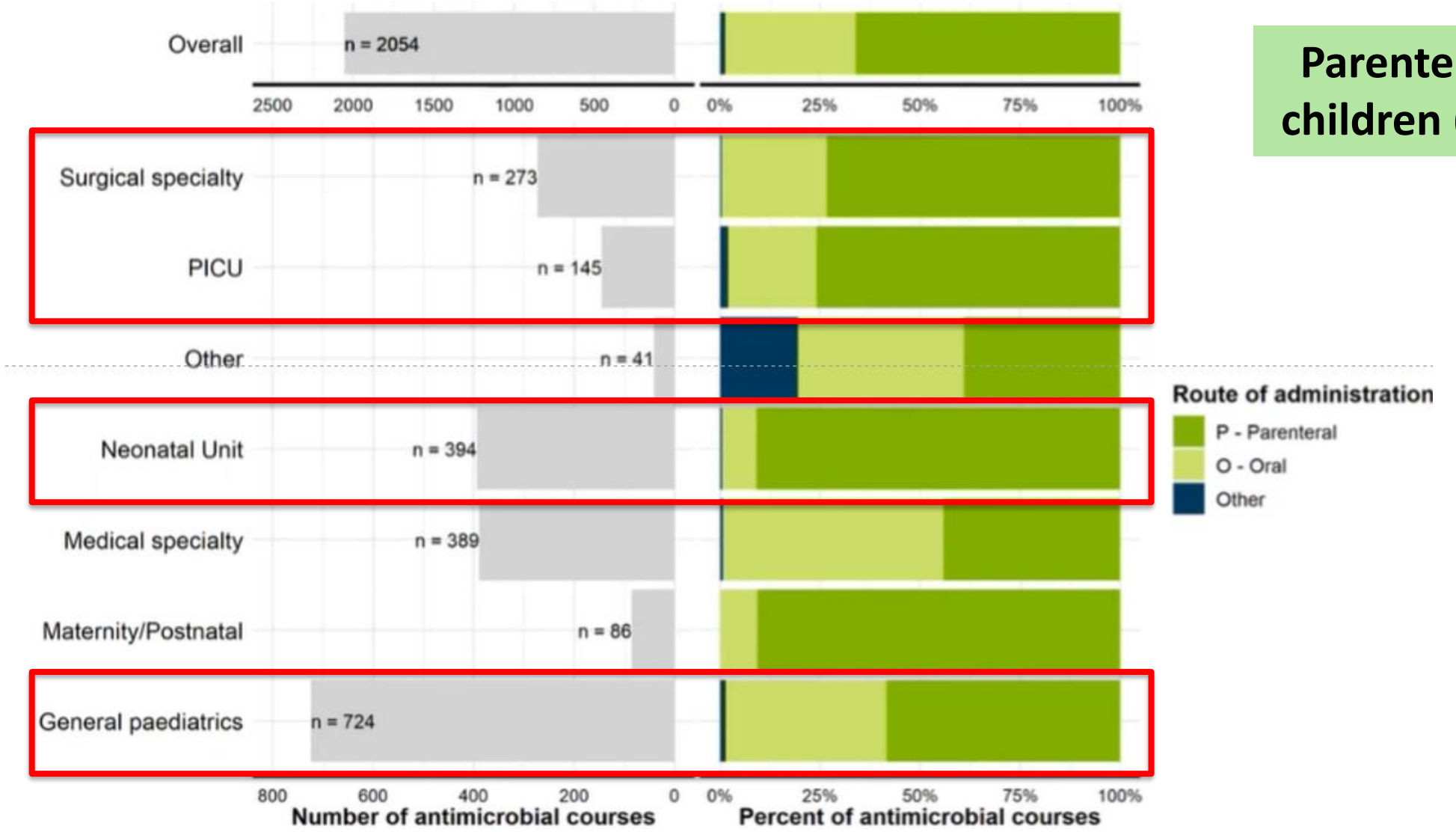
UK HSA point prevalence survey (2023 data)

- 4000 children
- 40% <1 month of age
- >50% tertiary hospitals



30% of general paediatric use for respiratory tract infections

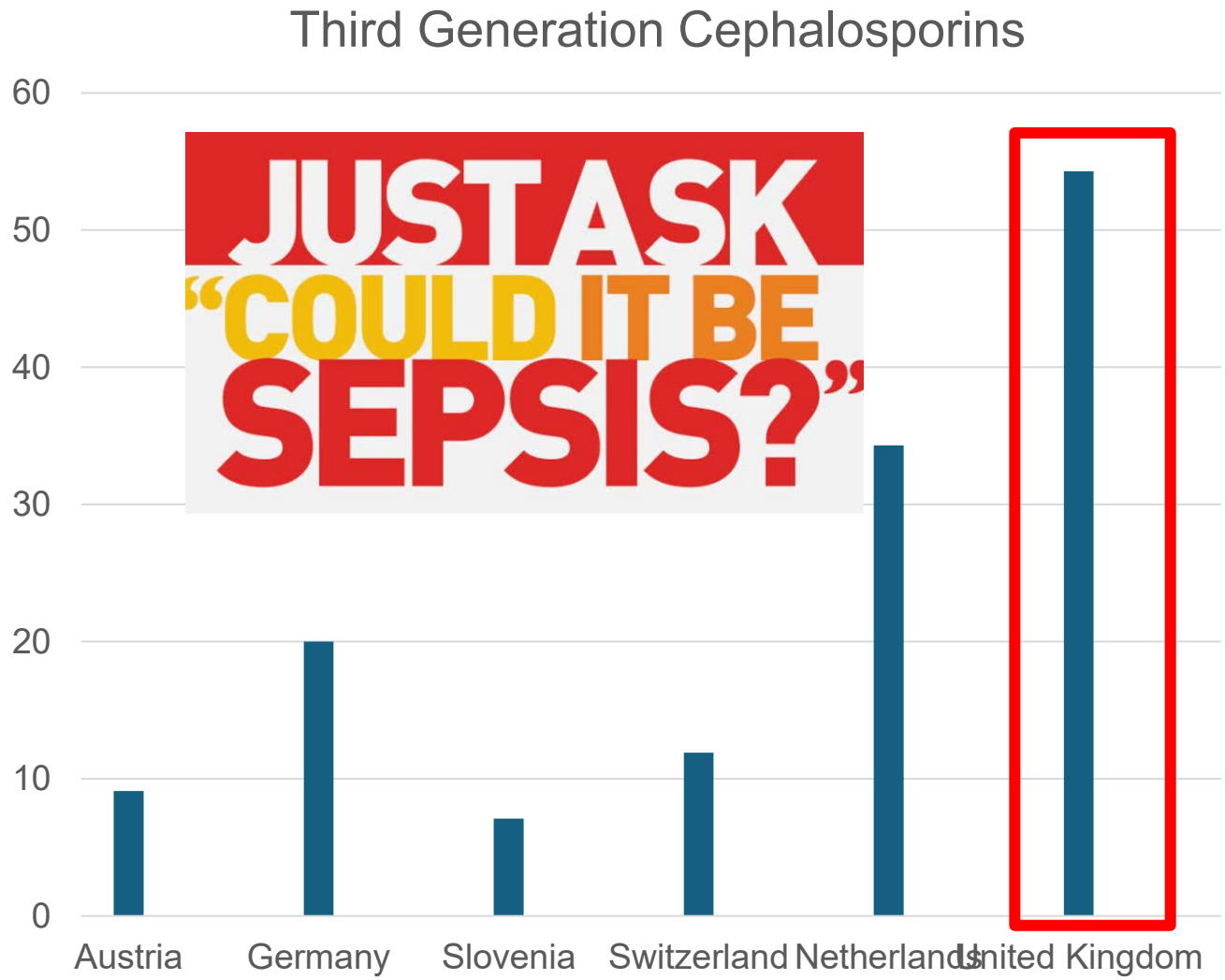
UK HSA PPS (AMS and HCAI 2023)



Parenteral use 66% in children (57% in adults)

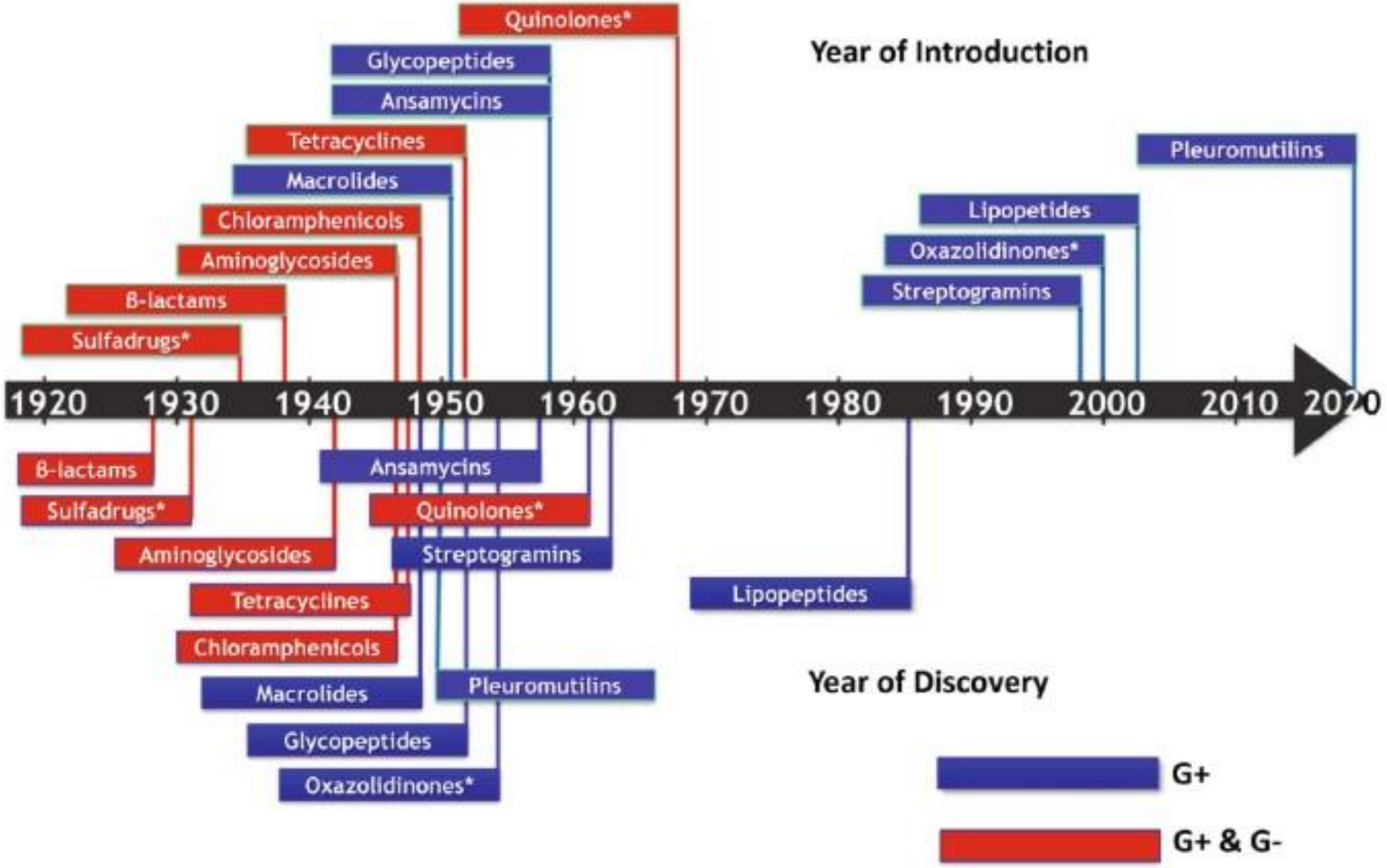
UK HSA PPS (AMS and HCAI 2023)

We use a lot of 3rd generation cephalosporins in UK



Kolberg, L et al (2024). Raising AWaRe-ness of Antimicrobial Stewardship Challenges in Pediatric Emergency Care: Results from the PERFORM Study Assessing Consistency and Appropriateness of Antibiotic Prescribing Across Europe. *Clinical infectious diseases*, *78*(3), 526–534.

Antibiotic discovery: few new agents in last 25 years



Staphylococcus aureus

PENICILLIN GIVEN TO ITS FIRST PATIENT 1941

1942 PENICILLIN RESISTANCE REPORTED

VANCOMYCIN INTRODUCED 1956

METHICILLIN INTRODUCED 1960

1961 METHICILLIN RESISTANCE REPORTED

1992 *STAPH AUREUS* GAINS VANCOMYCIN-RESISTANT GENE FROM *ENTEROCOCCI* BACTERIA

1997 PARTIAL VANCOMYCIN RESISTANCE REPORTED

QUINUPRISTIN/DALFOPRISTIN INTRODUCED 1999

2000 QUINUPRISTIN/DALFOPRISTIN RESISTANCE REPORTED

LINEZOLID INTRODUCED 2000

2001 LINEZOLID RESISTANCE REPORTED

2002 FULL VANCOMYCIN RESISTANCE REPORTED

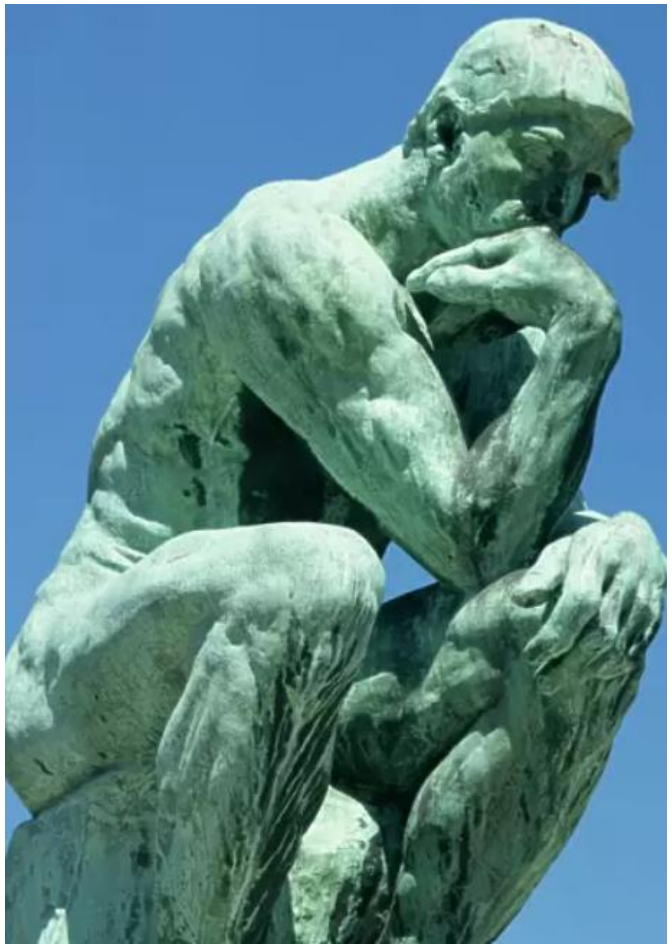
DAPTOMYCIN INTRODUCED 2003

2005 DAPTOMYCIN RESISTANCE REPORTED

TIGECYCLINE INTRODUCED 2005

2010 TIGECYCLINE RESISTANCE REPORTED

Lubelchek, *The Social Ecology of Infectious Diseases*, 2008



What can we do about it?!

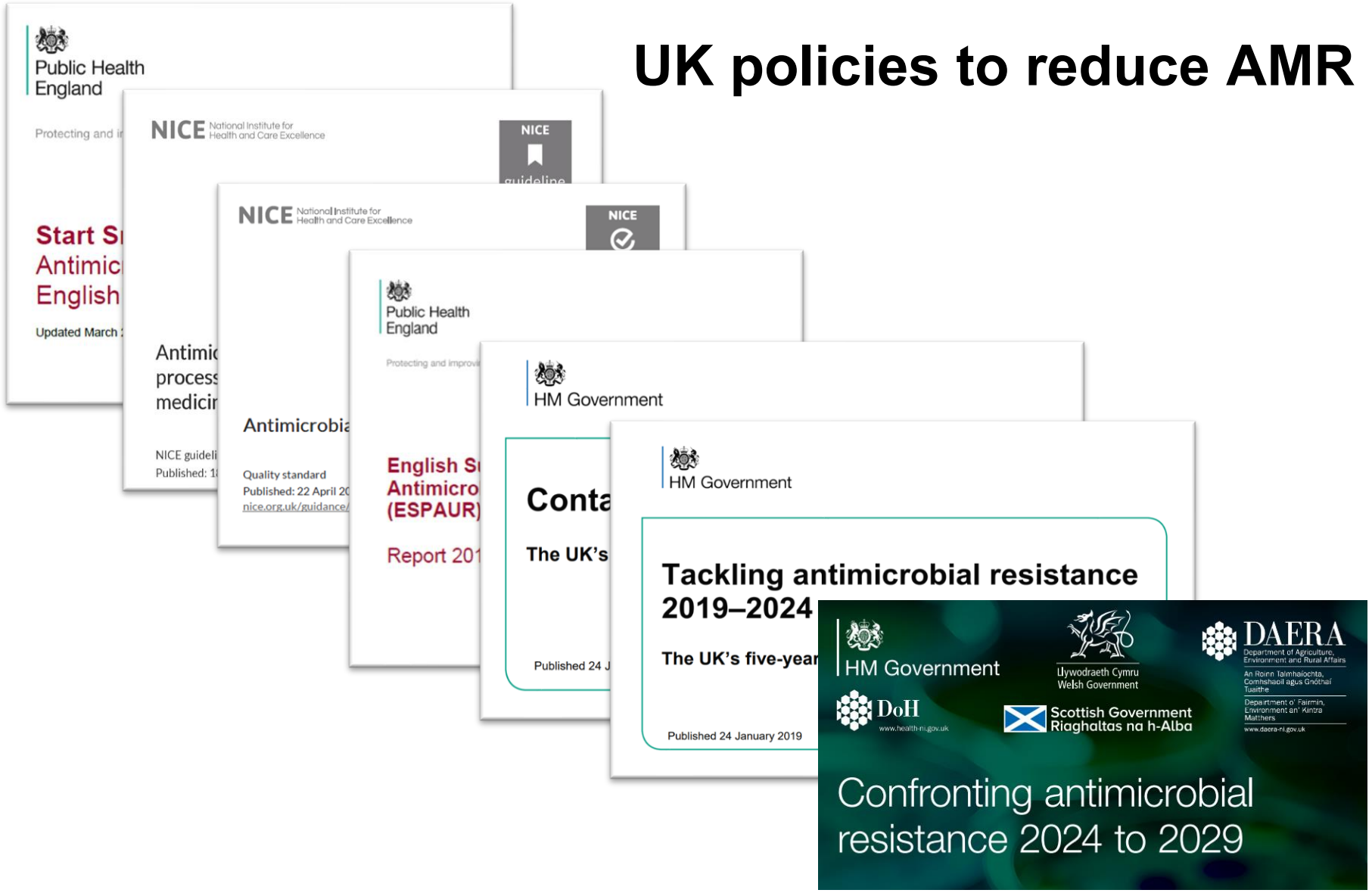

KEEP
CALM
AND DO
Antimicrobial
Stewardship

Stewardship is an ethical value that embodies the responsible planning and management of resources. The concepts of stewardship can be applied to the environment and nature, economics, health, places, property, information, theology, and cultural resources.

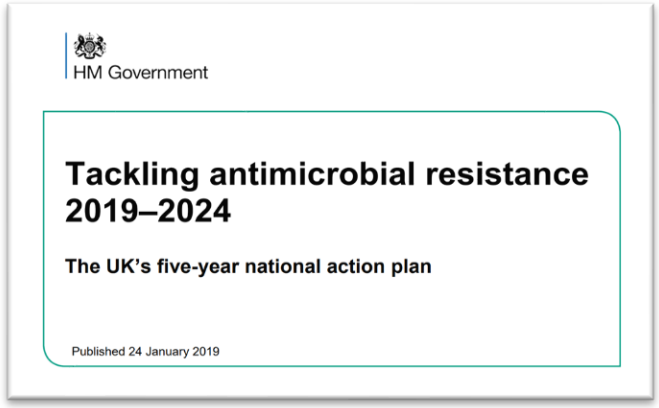
Wikipedia
https://en.wikipedia.org › wiki › Stewardship

Stewardship - Wikipedia

UK policies to reduce AMR



UK’s five-year national action plans



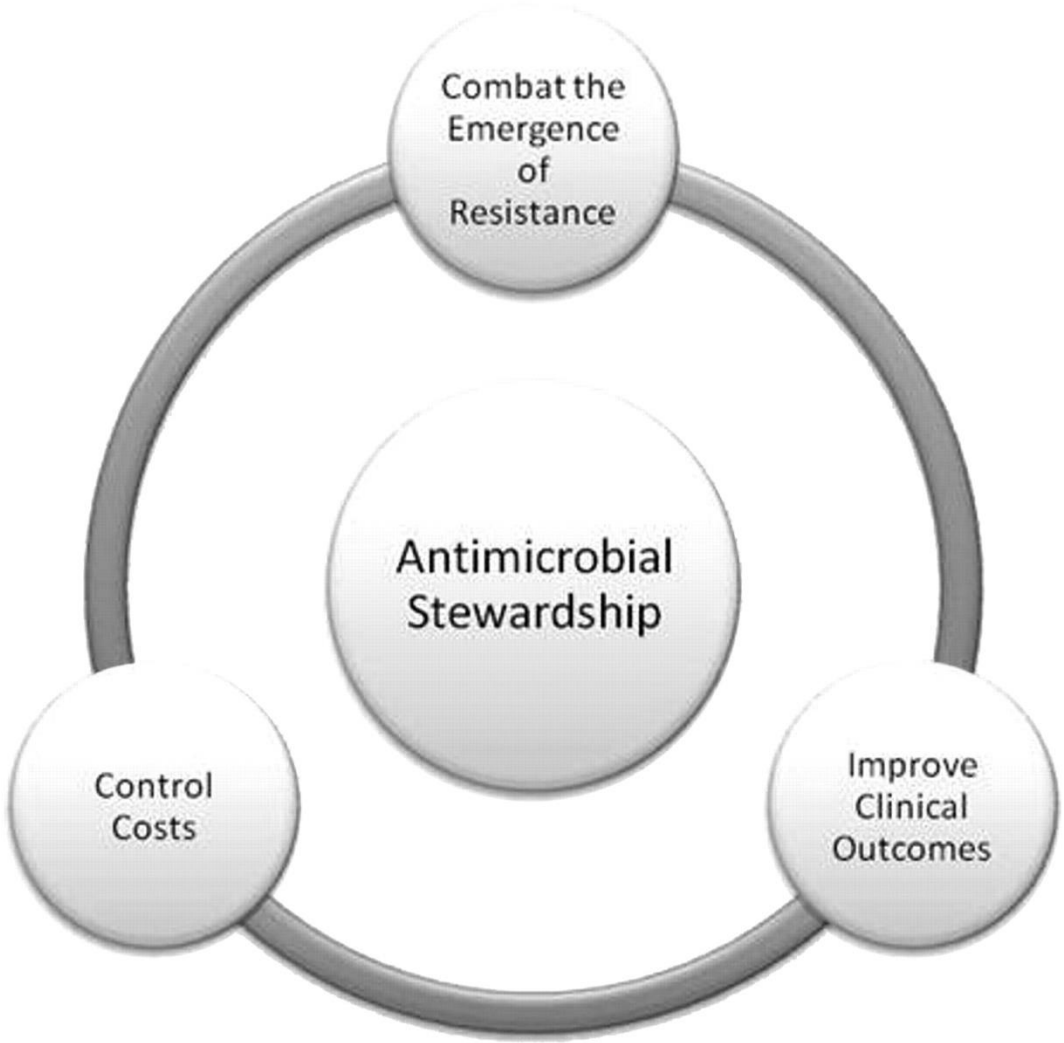
2019 – 2024

- Further reductions in the use of antibiotics in food-producing animals
- Development of improved surveillance systems
- Piloting of new payment schemes for antibiotics on the NHS

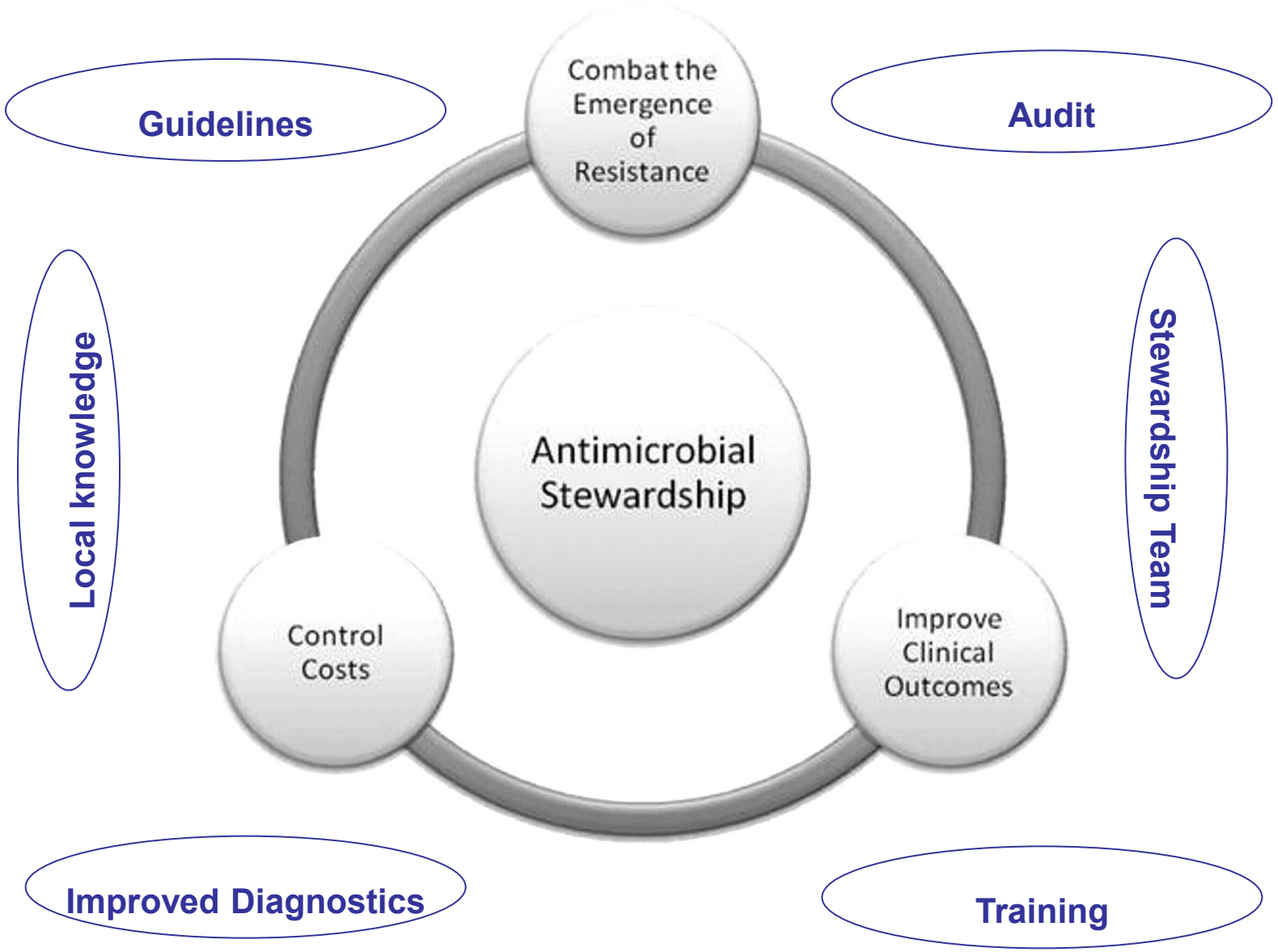
2024 – 2029

- Reducing the need for, and unintentional exposure to, antimicrobials
- Optimising the use of antimicrobials
- Investing in innovation, supply and access
- Being a good global partner

GOV·UK



Lawrence, Am J Resp Crit Care Med 2009


Guidelines
Audit
Local knowledge
Stewardship Team
Improved Diagnostics
Training
Combat the Emergence of Resistance
Antimicrobial Stewardship
Control Costs
Improve Clinical Outcomes

Antimicrobial Stewardship

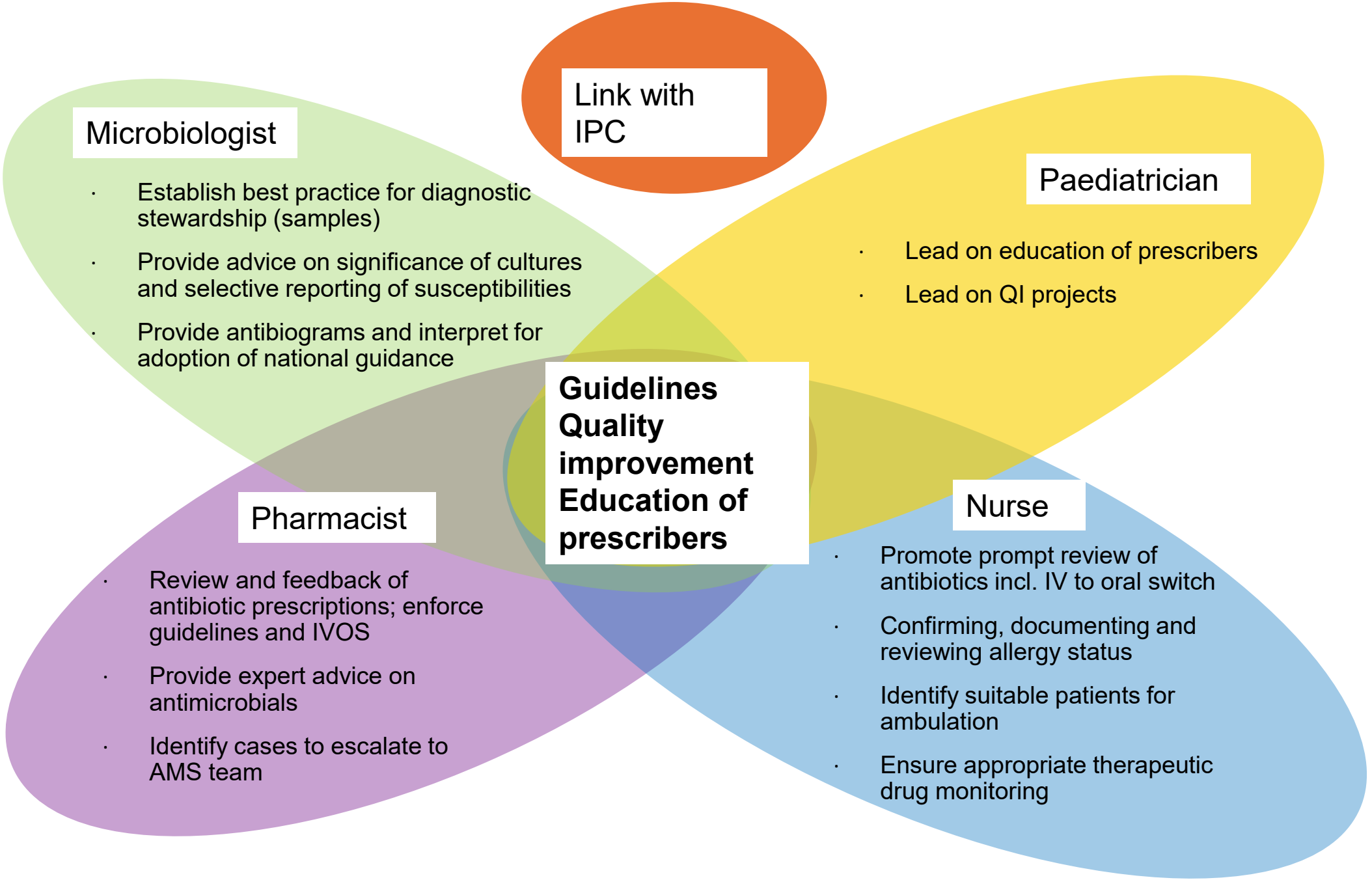
Three goals:

1. Optimise antimicrobial therapy for individual patients
   - Choice of antimicrobial, correct dose, appropriate route (including IVOS)
2. Minimise harm from antimicrobials
   - inc. therapeutic drug monitoring
3. Minimise development of resistance in children

(in conjunction with IPC practices)

We know how to achieve effective AMS

- Influencing antimicrobial use
  - Prospective audit and feedback (including choice of Ab and dose, TDMs)
    - “Handshake stewardship”- role of AMS ‘rounds’
- Implement clear, accessible infection guidance
  - Empirical antimicrobial prescribing guidance
  - Common infection pathways
- Collecting & benchmarking data on quantity and quality of antimicrobial prescribing
- Education of prescribers & non-prescribers (inc. nurses)
- Encouraging front line clinicians to conduct quality improvement projects


Link with IPC
Microbiologist
· Establish best practice for diagnostic stewardship (samples)
· Provide advice on significance of cultures and selective reporting of susceptibilities
· Provide antibiograms and interpret for adoption of national guidance
Paediatrician
· Lead on education of prescribers
· Lead on QI projects
Guidelines
Quality improvement
Education of prescribers
Pharmacist
· Review and feedback of antibiotic prescriptions; enforce guidelines and IVOS
· Provide expert advice on antimicrobials
· Identify cases to escalate to AMS team
Nurse
· Promote prompt review of antibiotics incl. IV to oral switch
· Confirming, documenting and reviewing allergy status
· Identify suitable patients for ambulation
· Ensure appropriate therapeutic drug monitoring

PIDJ
The Pediatric Infectious Disease Journal

Challenging Dogma in the Treatment of Childhood Infections

Oral Antibiotics and Shorter Durations

Daniel C. Tanti, MPH, BSc (Hons),† Brad Spellberg, MD,‡ and Brendan J. McMullan, BMed, PhD*†*

UTI
Osteoarticular infections
Bacteraemia
CNS infection
Appendicitis
Neonatal infections

The benefits of AMS

Economic argument:

- Reduced length of stay / addressing bed pressures
- Cost of IVAbs / nursing time administering IVAbs
- Cost for families of being in hospital

Patient satisfaction – earlier discharge and ↓cannulation

Carbon footprint of IVAbs

Patient safety:

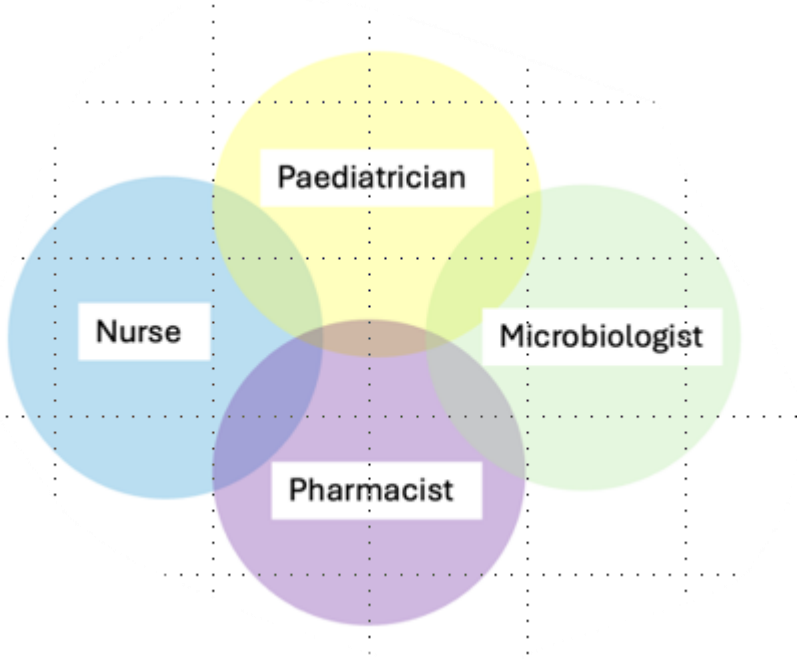
- Adverse drug reactions/ need for genetic testing (aminoglycosides)
- Microbiome

Antimicrobial resistance (AMR)

- In the individual: narrow versus broad spectrum Ab use

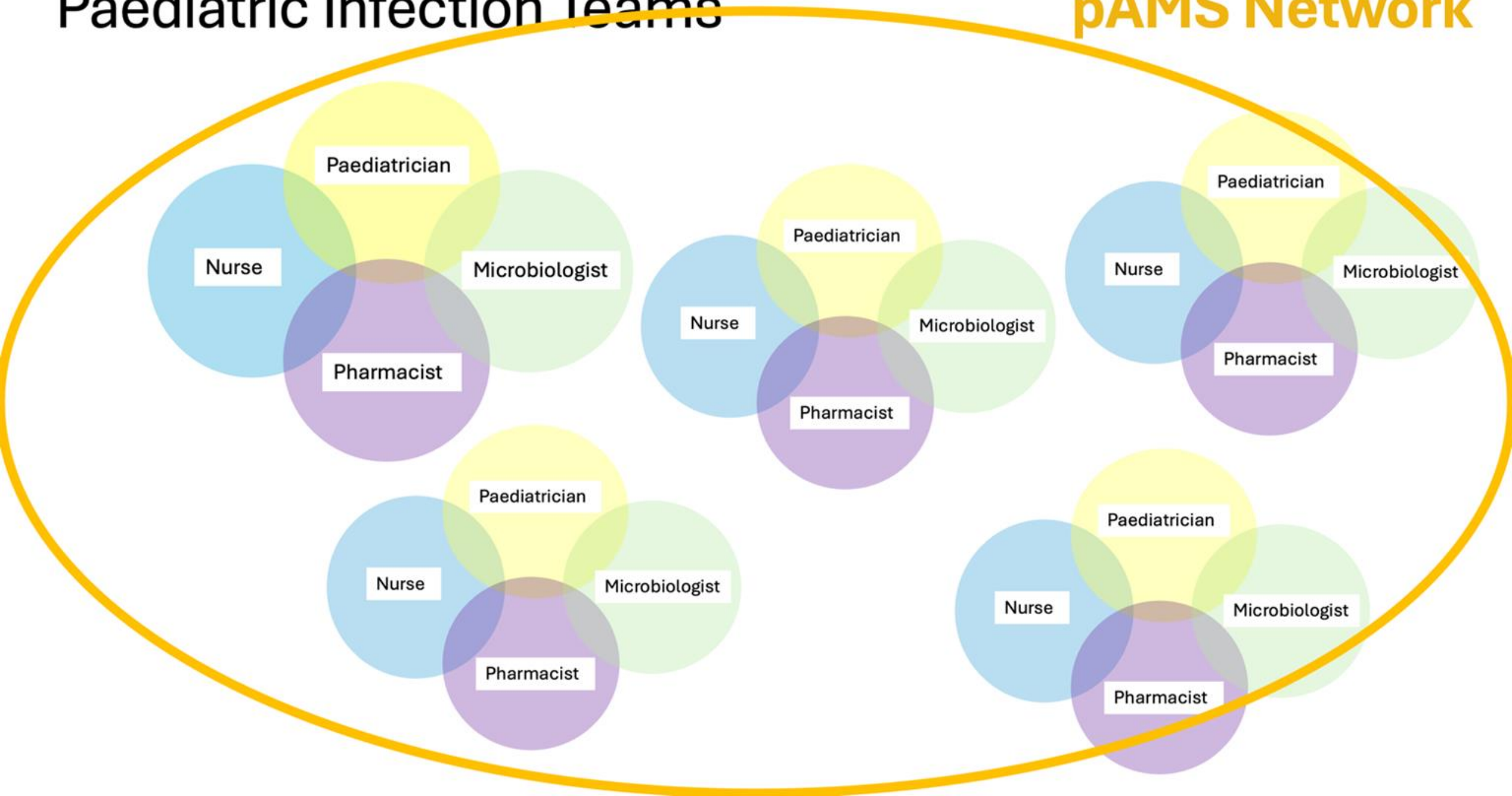
How can we get there?

Paediatric Infection Team

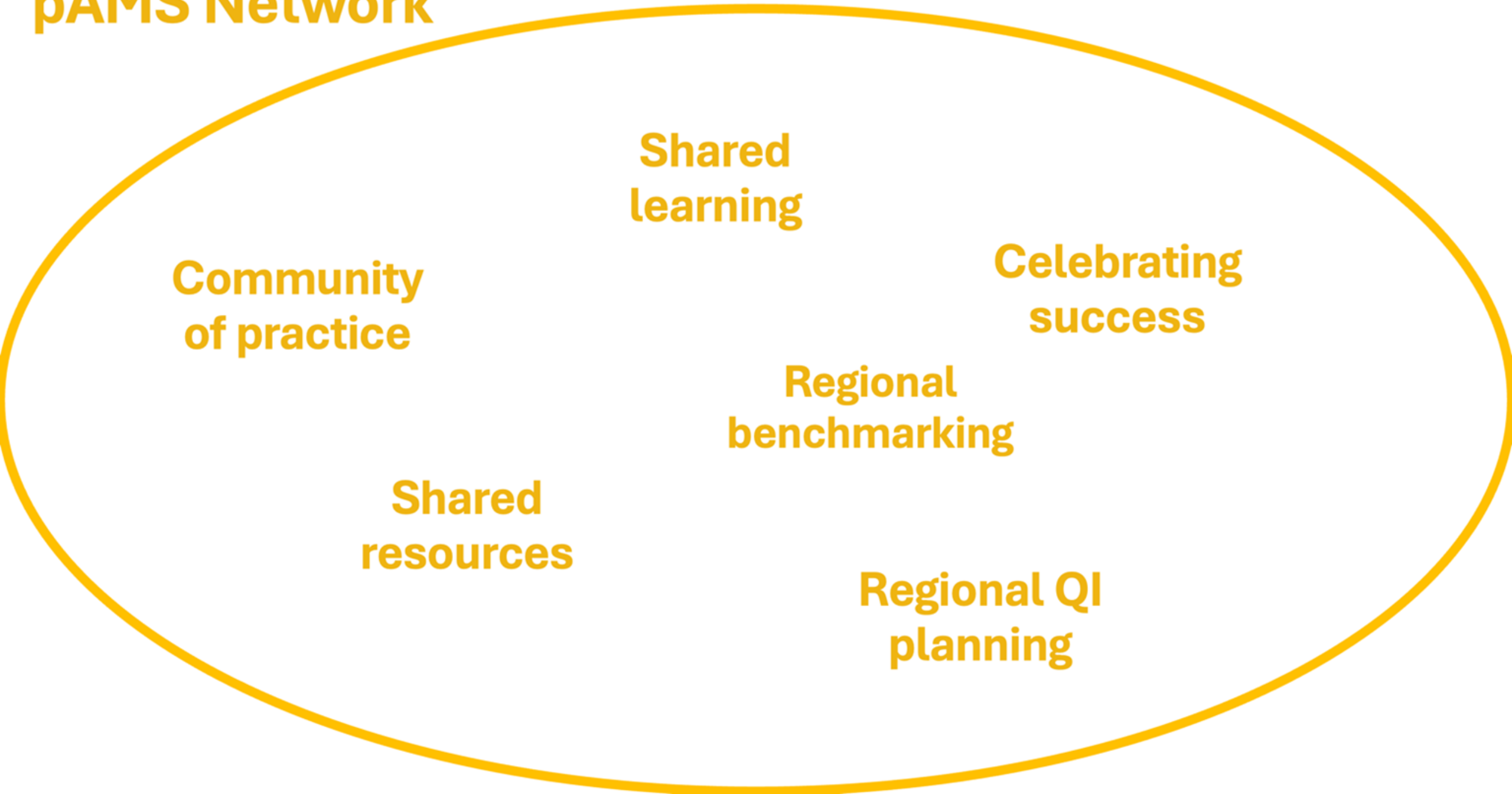


Paediatric Infection Teams

pAMS Network



pAMS Network



Vision

All hospitals in the UK to be part of collaborative regional pAMS networks and benefit from:

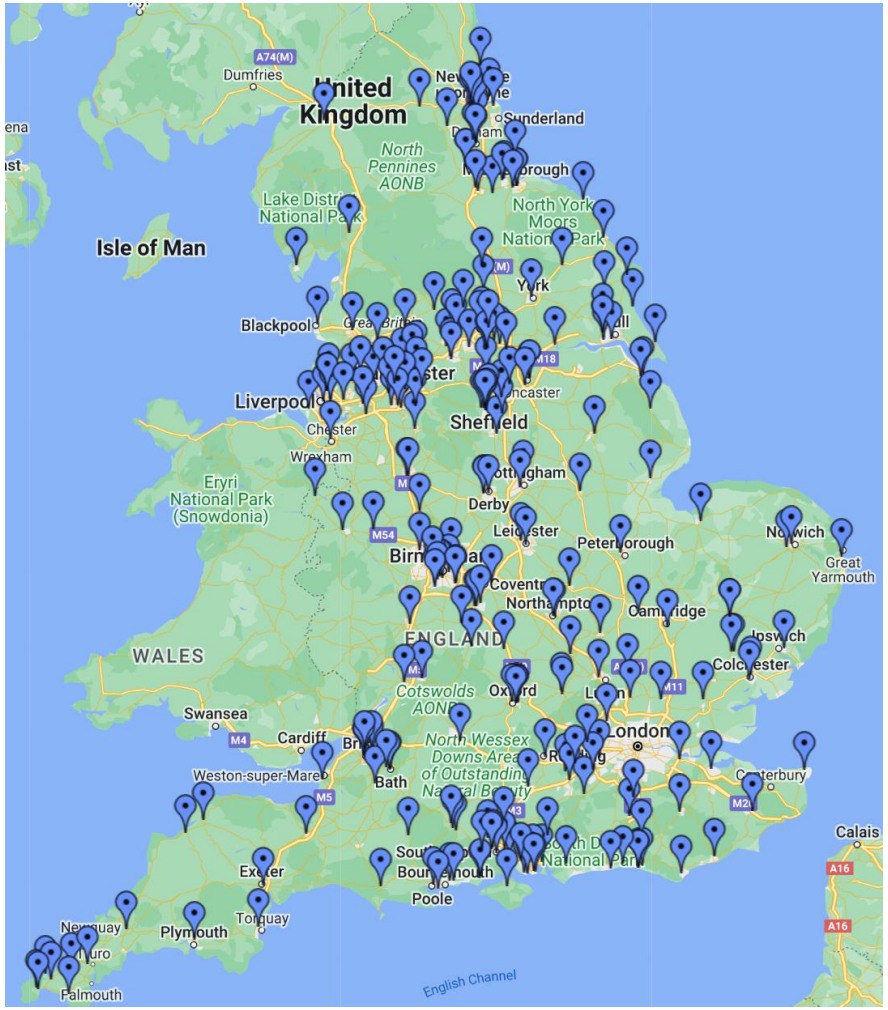
- Shared learning within community of practice
- Prescription quality monitoring and regional benchmarking service
- Access to educational resources for local use
- Greater team collaboration between and within hospitals

Scope for national connections between regions and expansion into primary care

Raising the profile of AMS and ultimately improve antimicrobial use for children

Tertiary children's hospitals

Local hospitals (paediatric inpatients)



NHSE pAMS network pilots

Sheffield Children's Hospital

Bristol Children's Hospital

Evelina Children's Hospital

Southampton Children's Hospital

Kent / East Sussex / South-East London Paediatric AMS Network

KESSEL-PAMS

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Kent, East Surrey and South East London
Paediatric Antimicrobial Stewardship