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<https://www.youtube.com/watch?v=YzDs-X3b9NQ>

Please scroll down this file to view a copy of the slides from the session.

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UK Health
Security
Agency

Public Health and Combating Antimicrobial Resistance (AMR)

Prof Diane Ashiru-Oredope
Lead Pharmacist and Joint Head of AMR PROGRESS Section
AMR & HCAI Division,
UK Health Security Agency

Chair: ESCMID Subgroup for Antimicrobial Stewardship;
Honorary Professor of Pharmaceutical Public Health: Universities of Nottingham

Public Health Ontario Rounds: 27 August 2026

Declarations and Affiliations

Honorary Academic roles:

- University of Nottingham, Teesside University, UCL School of Pharmacy, University of Bristol

Executive Committee Member

- Faculty of Public Health – Africa Special Interest Group
- European Society for Clinical Microbiology and Infections Diseases (ESCMID) Subgroup for Antimicrobial Stewardship (ESGAP)

Funding

- NIHR Senior Clinical and Practitioner Research Award (2024-2028)

Disclosure

- No commercial conflicts of interest to declare.

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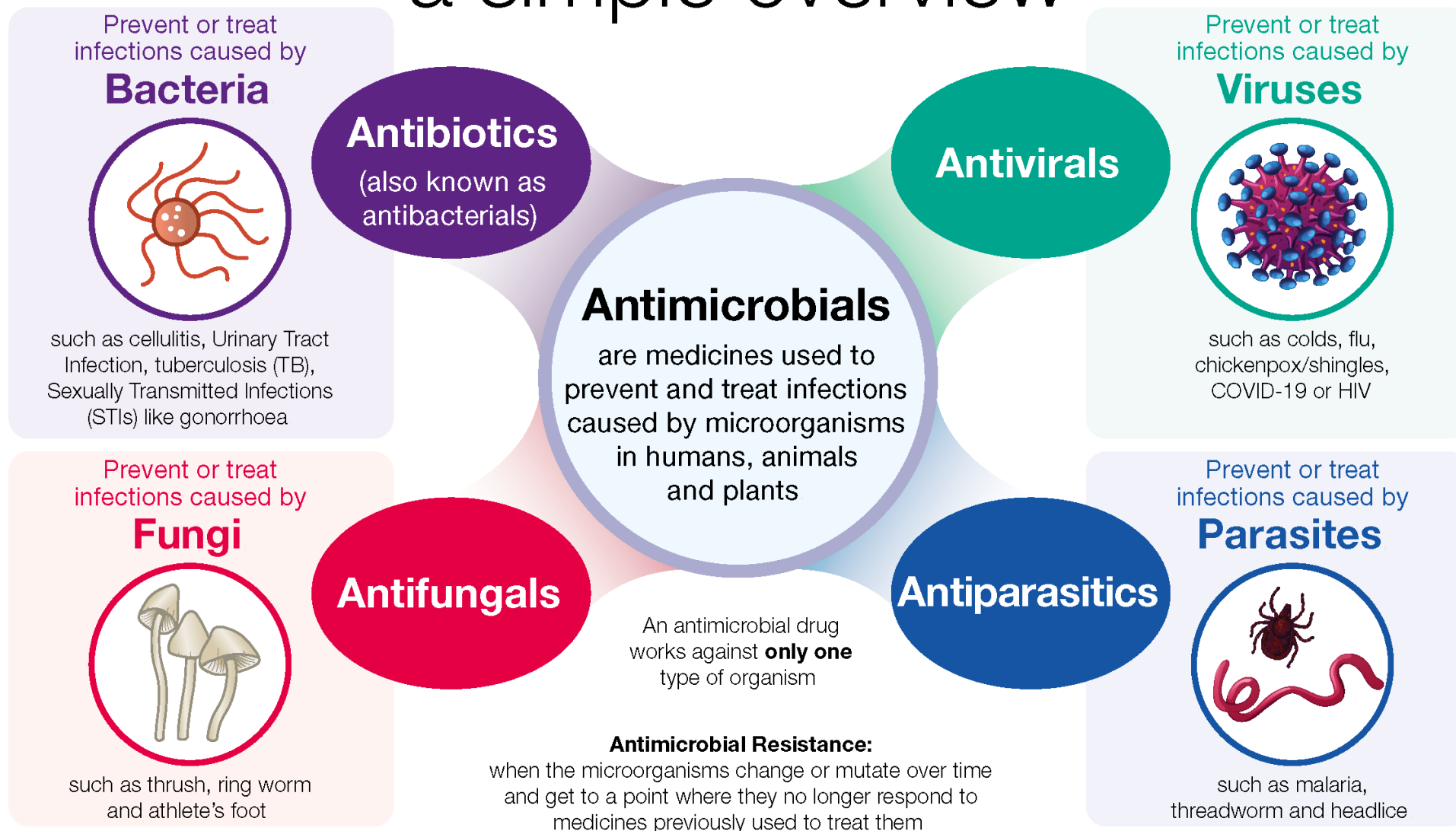
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Learning outcomes

By the end of this session, participants will be able to:

- Describe the public health burden of antimicrobial resistance and its implications for health systems.
- Summarize key UK public health strategies and initiatives used to advance antimicrobial stewardship and addressing health disparities at national and regional levels.
- Explain the role of public health organizations in AMR surveillance, stewardship leadership, partnership development, and workforce capacity building.
- Identify opportunities to adapt successful public health approaches from the UK to strengthen AMR mitigation efforts in Ontario and other jurisdictions.

Antimicrobials: a simple overview



Public health burden of antimicrobial resistance

Globally:

- **4.71 million deaths** were associated with bacterial AMR globally in 2021.
- **1.14 million deaths** were directly attributable to bacterial AMR. In 2023, approximately
- **1 in 6 laboratory-confirmed bacterial infections** worldwide was resistant to antibiotic treatment.

England:

- 13% increase in resistant bacteraemia since 2019

Canada:

- Council of Canadian Academies projects that if resistance to first-line antimicrobials among human infections rises from 26% in 2018 to 40% by 2050, 13,700 people in Canada could die each year due to AMR, with an estimated \$388 billion loss to gross domestic product and \$120 billion in healthcare costs

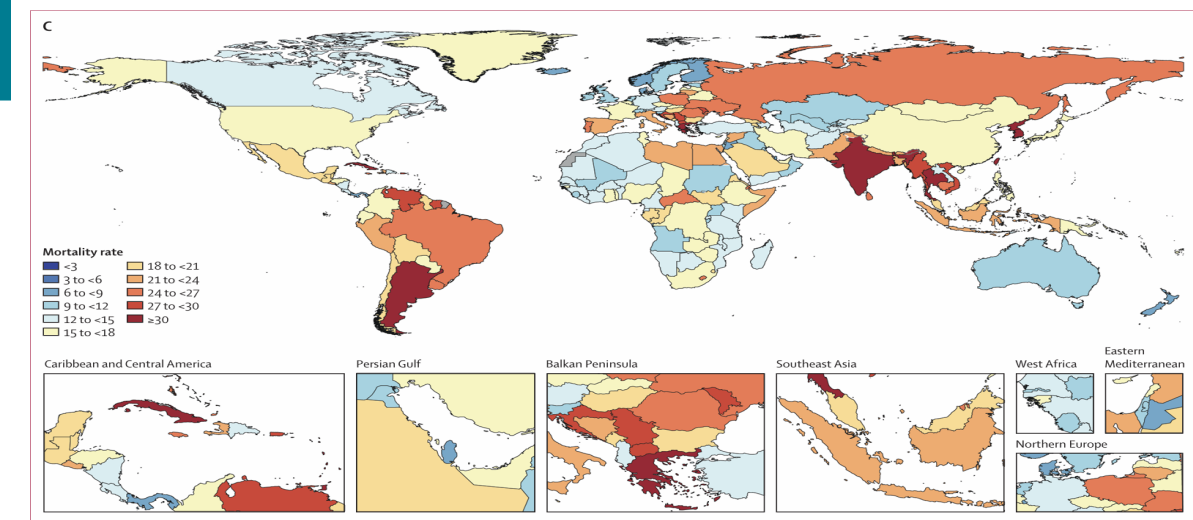
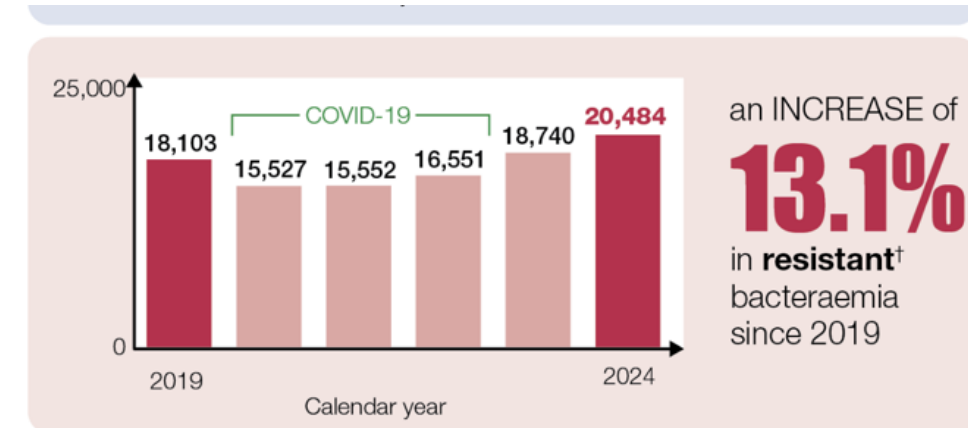


Figure 3: Death rates per 100 000 attributable to AMR, all ages, 1990, 2021, 2050
(A) Death rate attributable to AMR, all ages, 1990. (B) Death rate attributable to AMR, all ages, 2021. (C) Death rate attributable to AMR, all ages, 2050. AMR=antimicrobial resistance.

Naghavi et al. Global burden of bacterial antimicrobial resistance 1990–2021: a systematic analysis with forecasts to 2050 *The Lancet*, 2024; 404, 1199–1226



* Pathogens include: *E. coli*, *K. pneumoniae*, *K. oxytoca*, *Acinetobacter* spp., *Pseudomonas* spp., *Enterococcus* spp.

† *E. coli*, *K. pneumoniae* and *K. oxytoca*: resistant to any of: carbapenems, third-generation cephalosporin, aminoglycosides, fluoroquinolones, or carbapenems; *Pseudomonas* spp. resistant to three or more classes of antibiotics; glycopeptides; *S. aureus* resistant to methicillin; *S. pneumoniae* resistant to penicillin.

Implications for patients and health systems

AMR is a **health-system pressure multiplier**, not only a microbiology or prescribing problem.

Patient outcomes/impact

- modern medicine depends on effective antimicrobials
- cancer chemotherapy;
- organ and stem-cell transplantation;
- joint replacement and other major surgery;
- neonatal and intensive care; dialysis;
- management of trauma and burns;
- childbirth and caesarean section;
- treatment of immunocompromised patients.

Health Systems

- Longer hospital stays and greater demand for critical care.
- Additional diagnostic testing, screening, isolation and environmental cleaning.
- Dependence on second- or third-line agents that may be more costly, toxic or difficult to administer.
- Increased pressure on specialist infection, microbiology, pharmacy, IPC and public-health teams.
- Greater risk of healthcare-associated outbreaks.
- Reduced bed availability and disruption of elective services.
- More difficult discharge and increased demand on community and long-term care.
- Widening inequalities where access to diagnostics and specialist treatment is uneven

Global Actions to tackle AMR:

Global Action Plan on AMR 2026–2036: Strategic objectives

Awareness and behaviour change

- Move beyond awareness to sustained, evidence-based social and behavioural change

Surveillance and laboratory capacity

- Strengthen integrated One Health surveillance and quality-assured laboratory networks to support evidence-driven policy and action.

Infection prevention

- Prevent infections in humans, animals, plants and food systems—reducing disease, antimicrobial demand and environmental contamination.

Access and appropriate use

- Ensure equitable access to quality-assured antimicrobials, diagnostics and other health products, alongside effective stewardship and safe disposal.

Research and innovation

- Accelerate multidisciplinary research and the development and uptake of new antimicrobials, vaccines, diagnostics, alternatives and environmental solutions.

Governance, financing and accountability

- Strengthen multisectoral governance, sustainable financing and transparent accountability for a coordinated One Health response at every level.

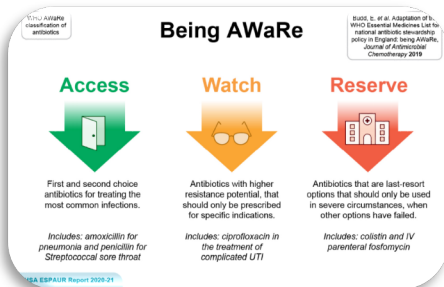
Aims:

- achieve a **10% reduction in bacterial AMR-associated human deaths**;
- reduce global antimicrobial use in agrifood systems;
- minimize environmental pollution of AMR microbes and antimicrobial residues by 2030



The World Health Assembly adopts updated Global Action Plan on Antimicrobial Resistance (2026–2036)

25 May 2026 | Departmental update | Geneva, Switzerland | Reading time: 1 min (382 words)



WHO Strategic
Priorities on
Antimicrobial Resistance
Preserving antimicrobials
for today and tomorrow

WHO POLICY
GUIDANCE ON
INTEGRATED
ANTIMICROBIAL
STEWARDSHIP
ACTIVITIES

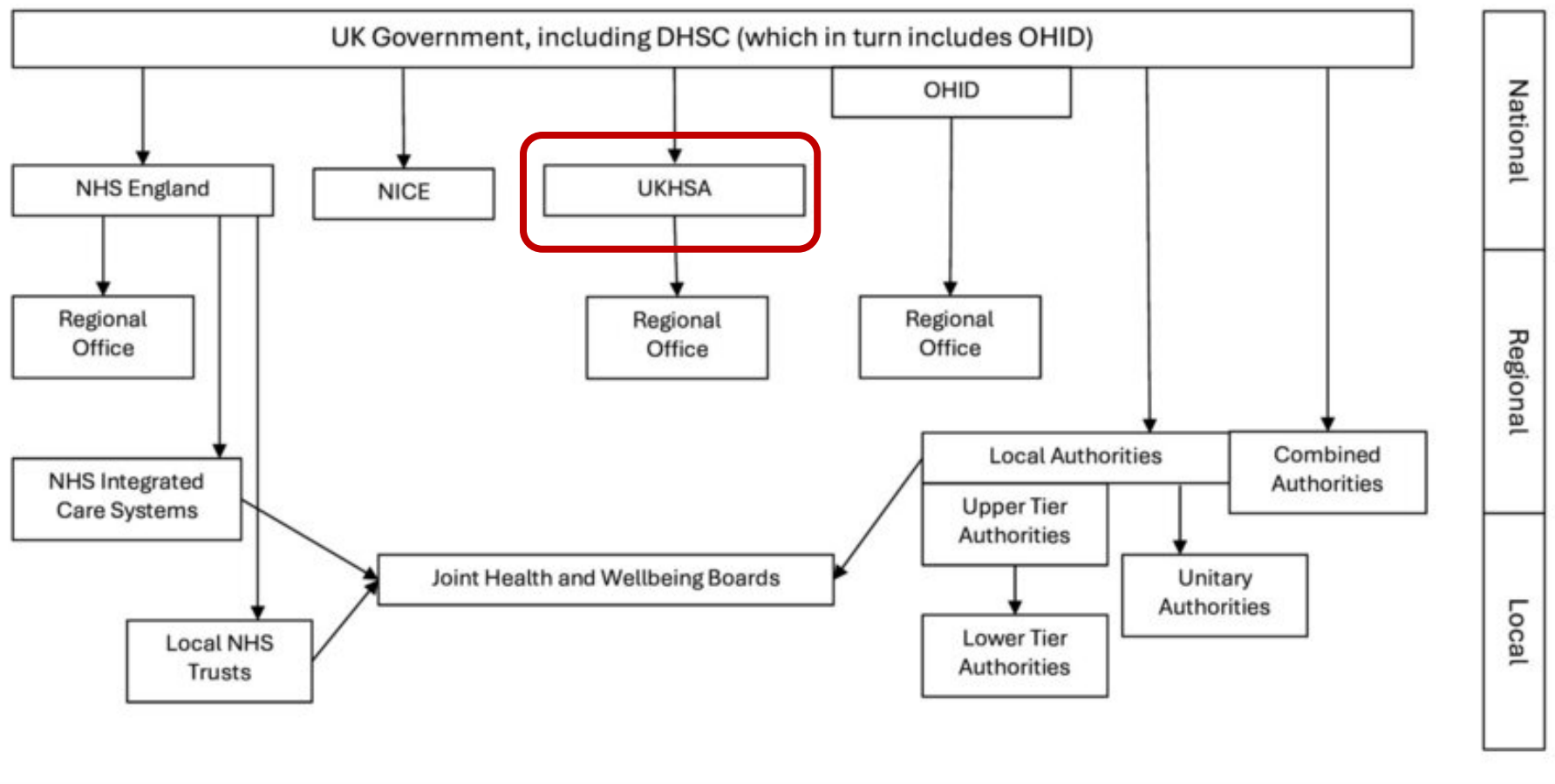




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UK public health strategies and initiatives used to advance antimicrobial stewardship at national and regional levels

The public health system in England in 2024. DHSC, Department of Health and Social Care; NHS, National Health Service; NICE, National Institute for Health and Care Excellence; OHID, Office for Health Improvement and Disparities; UKHSA, UK Health Security Agency



Health is devolved in the UK for the 4 UK countries

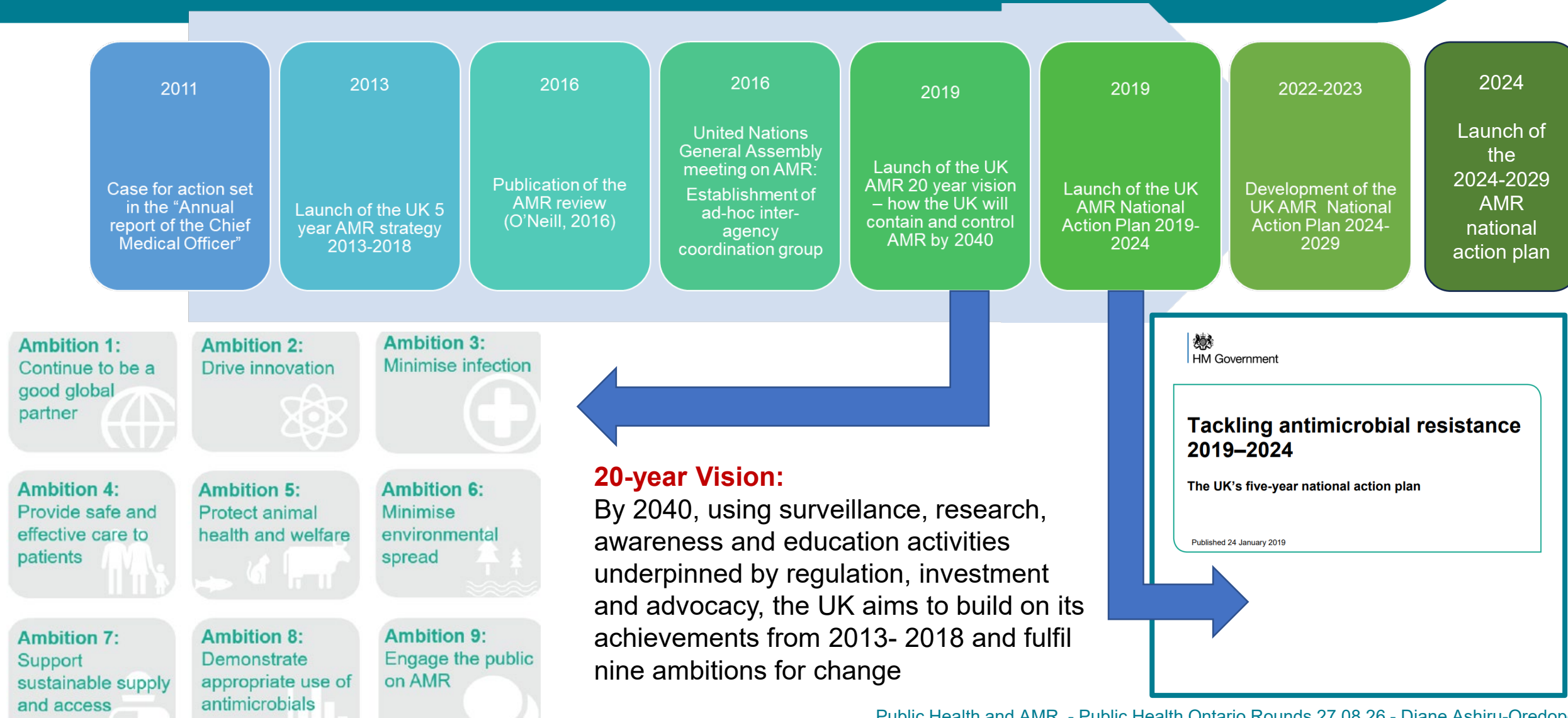
- England
- Scotland
- Wales
- Northern Ireland

UKHSA is mainly focused on England's Health Protection but has some UK-wide health protection functions

OHID – Health Improvement
NHS England - Healthcare public health

Walsh et al (2025). Scoping review of dementia primary prevention policies in England: do they balance reach and agency?. *BMJ Public Health*. 3. 10.1136/bmjph-2025-002631.

National Actions to address antimicrobial resistance: the evolution of the UK's response to tackling AMR



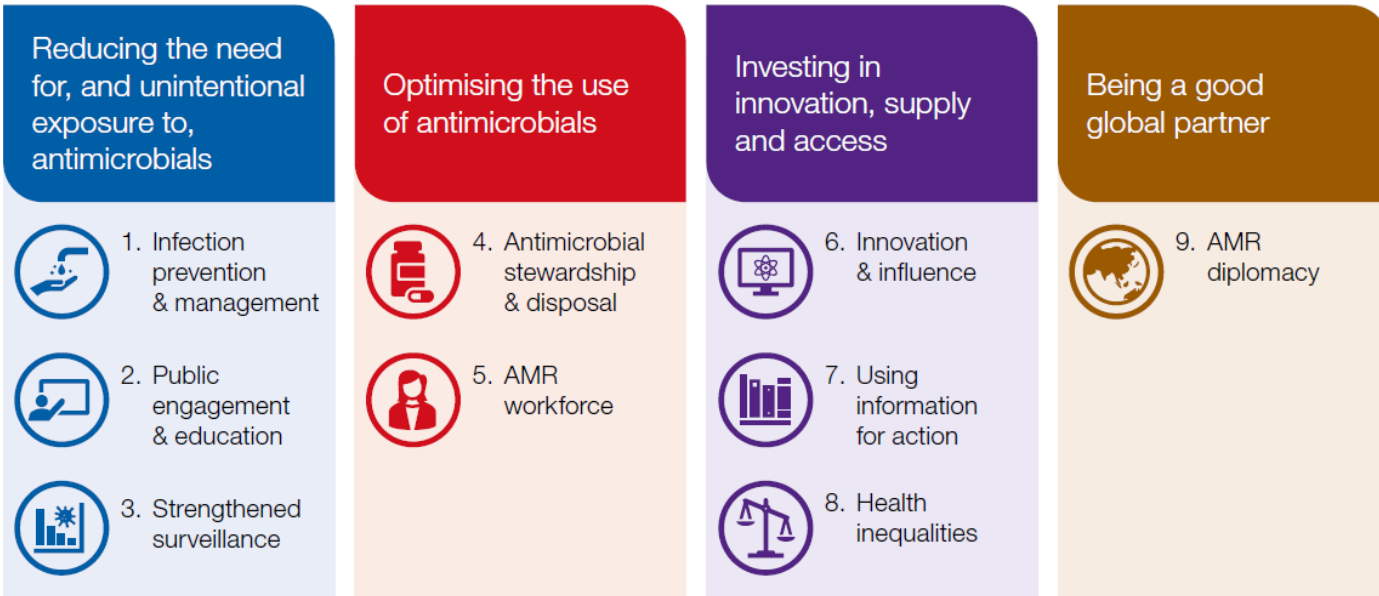
2024-29 UK AMR National Action Plan (NAP) published 8th May 2024



9 outcomes, which summarise the direct impacts the 2024-29 NAP is intended to have (three of which are supported by human health **targets**)



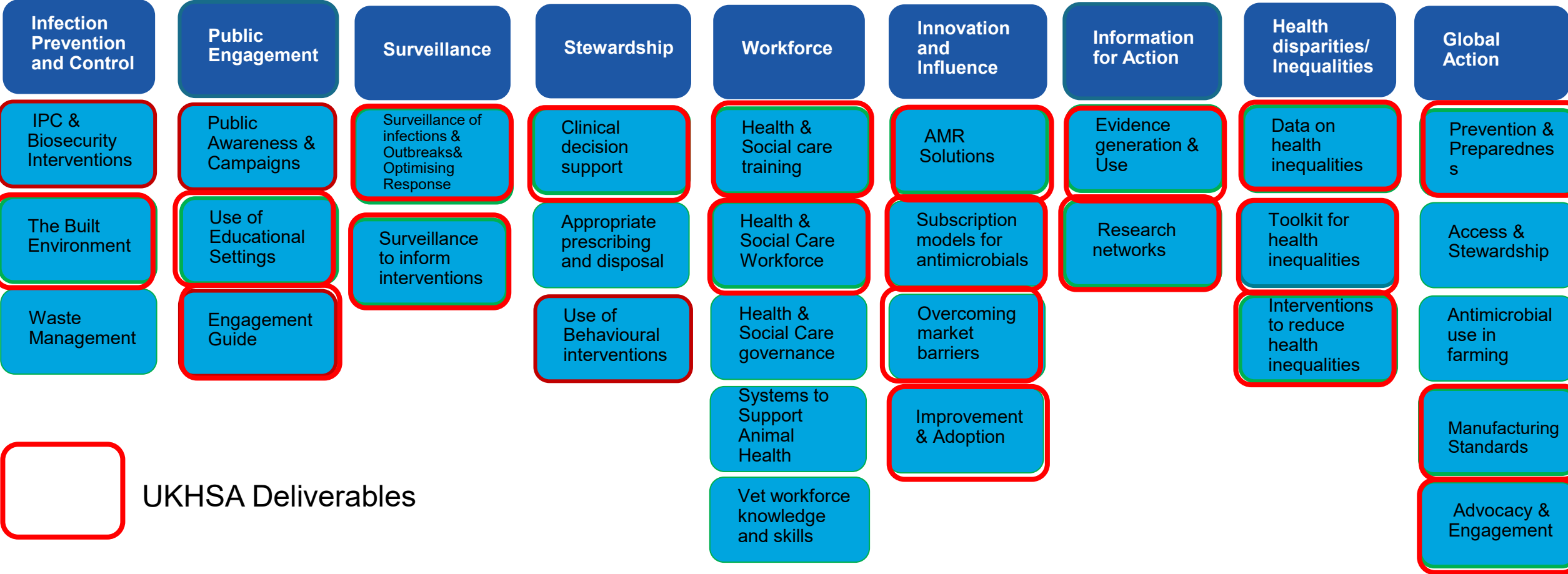
30 commitments, which set out what action will be undertaken by government organisations to achieve the outcomes (underpinned by **deliverables**)



2024 – 2029 UK National Action Plan on AMR

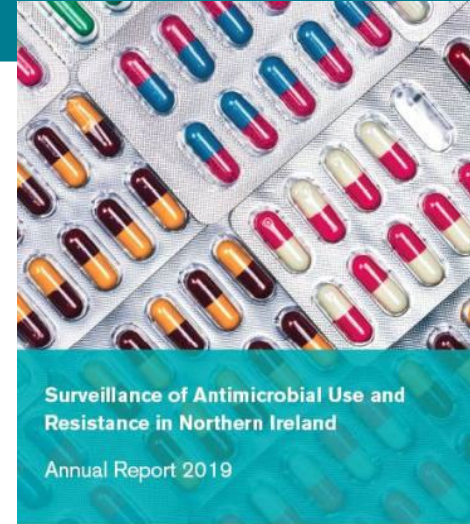


9 outcomes and 30 commitments



Proactive AMR Surveillance in all four UK nations

- Healthcare devolved
- Surveillance systems capabilities are different
- **All working towards same UK AMR action plan targets**
- Progress being made by all countries towards targets
- Across all 4 nations, >70% of antibiotic use is in primary care



HSC Public Health Agency

UK Health Security Agency

English surveillance programme for antimicrobial utilisation and resistance (ESPAUR)

Report 2021 to 2022



Publication date:
15 November 2022

WHC (2022) Number 014

WELSH HEALTH CIRCULAR



Llywodraeth Cymru
Welsh Government

Issue Date: 1 March 2022

STATUS: ACTION / INFORMATION
CATEGORY: QUALITY & SAFETY

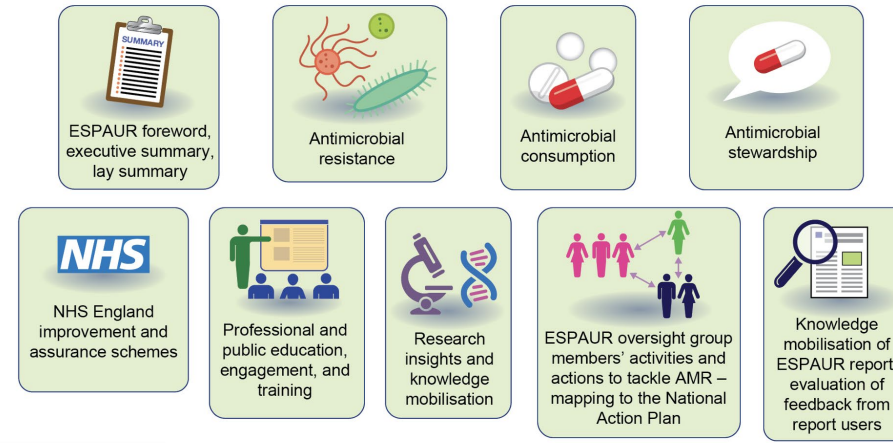
Title: **AMR & HCAI IMPROVEMENT GOALS FOR 2021-23**
Date of Expiry / Review: 31st March 2023

National Report in England via UKHSA's English Surveillance Programme for Antimicrobial Utilisation and Resistance (ESPAUR)

Have published 12 reports since ESPAUR inception (2014) – currently drafting the 13th report

- What does the report present?
 - burden of **AMR** in England
 - antimicrobial consumption** in GPs, community settings and secondary care
 - antimicrobial stewardship** interventions
 - professional** and **public education** and **training**
 - summary of ongoing and published **research**
- Why are these findings important?
 - understand **gaps in surveillance including those linked to health inequalities** that need to be addressed (deprivation, specific groups)
 - to ensure we are on track to meet the **UK NAP targets** (England)
 - data for action

ESPAUR Report 2024-25



UKHSA ESPAUR Report 2024-25

J Antimicrob Chemother 2013; 68: 2421–2423
doi:10.1093/jac/dkt363 Advance Access publication 11 September 2013

Antimicrobial
Chemotherapy

<https://doi.org/10.1093/jac/dkz446> Advance Access publication 19 August 2023

Journal of
Antimicrobial
Chemotherapy

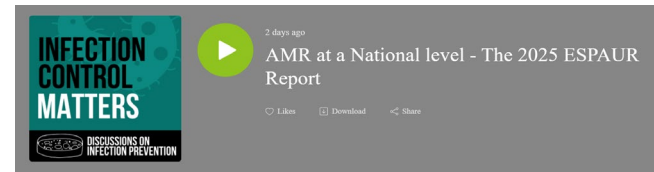
Antimicrobial stewardship: English Surveillance Programme for Antimicrobial Utilization and Resistance (ESPAUR)

Diane Ashiru-Oredope* and Susan Hopkins on behalf of the English Surveillance Programme for Antimicrobial Utilization and Resistance Oversight Group†

Healthcare Associated Infection, Antimicrobial Resistance and Stewardship (HCAI and AMRS) Programme, Public Health England, London SE1 8UG, UK

Reporting England's progress towards the ambitions in the UK action plan for antimicrobial resistance: the English surveillance programme for antimicrobial utilisation and resistance (ESPAUR)

Diane Ashiru-Oredope*, Neil Cunningham², Ella Casale¹, Berit Muller-Pebody¹, Russell Hope¹, Colin S. Brown¹ and Susan Hopkins²; on behalf of the 2022 ESPAUR Report Chapter Leads Group†



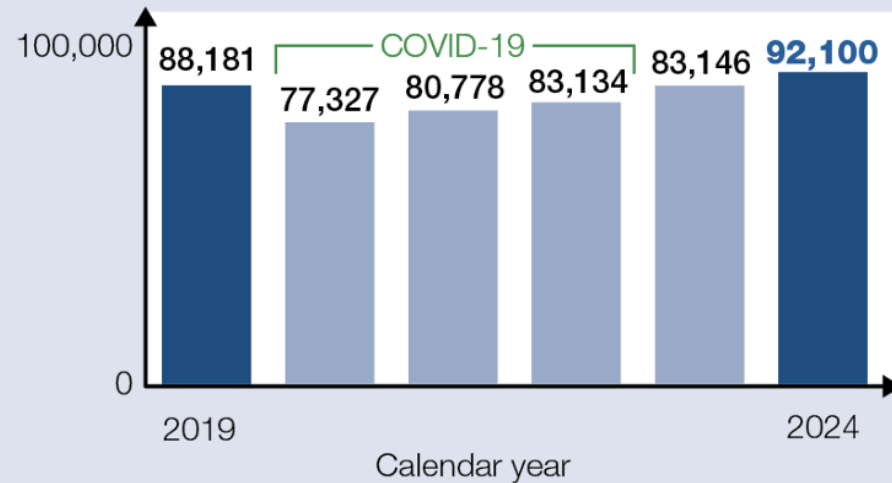
INNOVATION
NEWS NETWORK

Antibiotic-resistant infections are on the rise, UKSHA warns

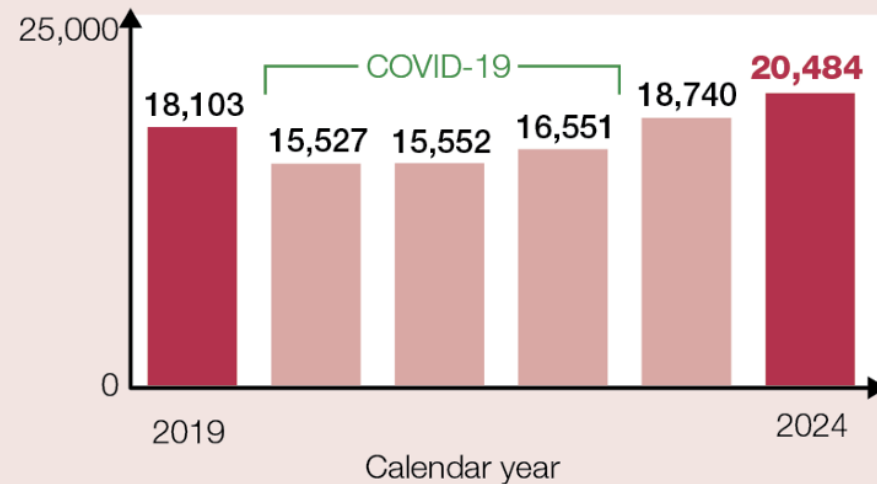
Health 13th November 2025



The burden of bacteraemia and resistant bacteraemia



an INCREASE of
4.4%
in numbers of
bacteraemia*
since 2019



an INCREASE of
13.1%
in **resistant**[†]
bacteraemia
since 2019

2019



2024



 Resistant

 Susceptible

This means that

22 out of **100**

people with a bacteraemia* had
a **resistant** infection in 2024

* Pathogens include: *E. coli*, *K. pneumoniae*, *K. oxytoca*, *Acinetobacter* spp., *Pseudomonas* spp., *Enterococcus* spp., *S. aureus* and *S. pneumoniae*.

† *E. coli*, *K. pneumoniae* and *K. oxytoca*: resistant to any of: carbapenems, third-generation cephalosporin, aminoglycosides or fluoroquinolones; *Acinetobacter* spp: resistant to aminoglycosides and fluoroquinolones, or carbapenems; *Pseudomonas* spp. resistant to three or more antimicrobial groups, or carbapenems; *Enterococcus* spp. resistant to glycopeptides; *S. aureus* resistant to methicillin; *S. pneumoniae* resistant to penicillin and macrolides, or penicillin.

Reductions in prescribing

Primary care:

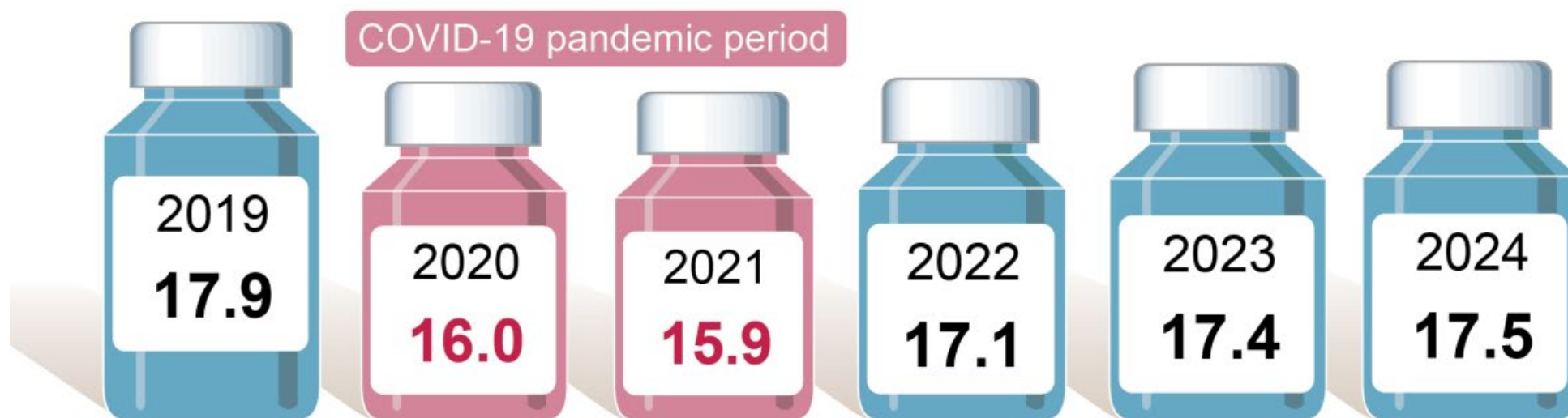
From 2019 to 2024, DID values decreased by **2.0%**

Secondary care:

Between 2023 and 2024, declined by **1.4%** (from 4,728 DDDs per 1,000 admissions).

Reductions estimated to save **£6.5M**.

Total consumption of antibiotics increasing towards pre-pandemic levels



(DDD per 1,000 inhabitants per day)

Antimicrobial Stewardship

- Antimicrobial stewardship' is defined as 'an organisational or healthcare-system-wide approach to promoting and monitoring judicious use of antimicrobials to preserve their future effectiveness' (NICE, 2015)
- Optimising prescribing of antimicrobials:
 - improve patient outcomes,
 - reduce microbial resistance,
 - decrease the spread of infections caused by multidrug-resistant organisms
- Everyone has a role



National levers to catalyse and sustain AMS actions:

A coordinated pathway from the UK's 2040 vision to measurable antimicrobial-stewardship delivery

2029 HUMAN-HEALTH TARGETS

–5% total use vs 2019

70% Access antibiotics

1

2040 VISION

Contain and control AMR: minimise infection; assure safe, effective care; maintain access; improve antimicrobial use; and engage the public.

HM Government

Contained and controlled

The UK's 20-year vision for antimicrobial resistance

Published 24 January 2019

2

2024–29 NATIONAL ACTION PLAN

Outcome 4 strengthens antimicrobial and diagnostic stewardship through decision support, appropriate prescribing and disposal, and behavioural interventions.

3

CODE OF PRACTICE + CQC (CQC, the independent regulator of health and social care in England)

Criteria 3 and 5 make stewardship, prompt identification and appropriate treatment inspectable evidence of safe, well-governed care.

4

NHS IMPROVEMENT & ASSURANCE

Oversight frameworks, contracts, CQUINs, Quality Premiums and pharmacy schemes translate priorities into targets, incentives, audit and accountability.

5

DATA, EDUCATION & BEHAVIOUR

ESPAUR and local indicators; TARGET and Start Smart Then Focus; e-Bug, feedback, commitment interventions and public campaigns support delivery.



e-Bug
operated by UK Health
Security Agency

e-Bug provides free educational resources for ages 3-16 on microbiology, hygiene, infections and appropriate antibiotic use

www.e-bug.eu

RCGP LEARNING

Home Resources Site blog

You are currently using guest access

TARGET antibiotics toolkit hub

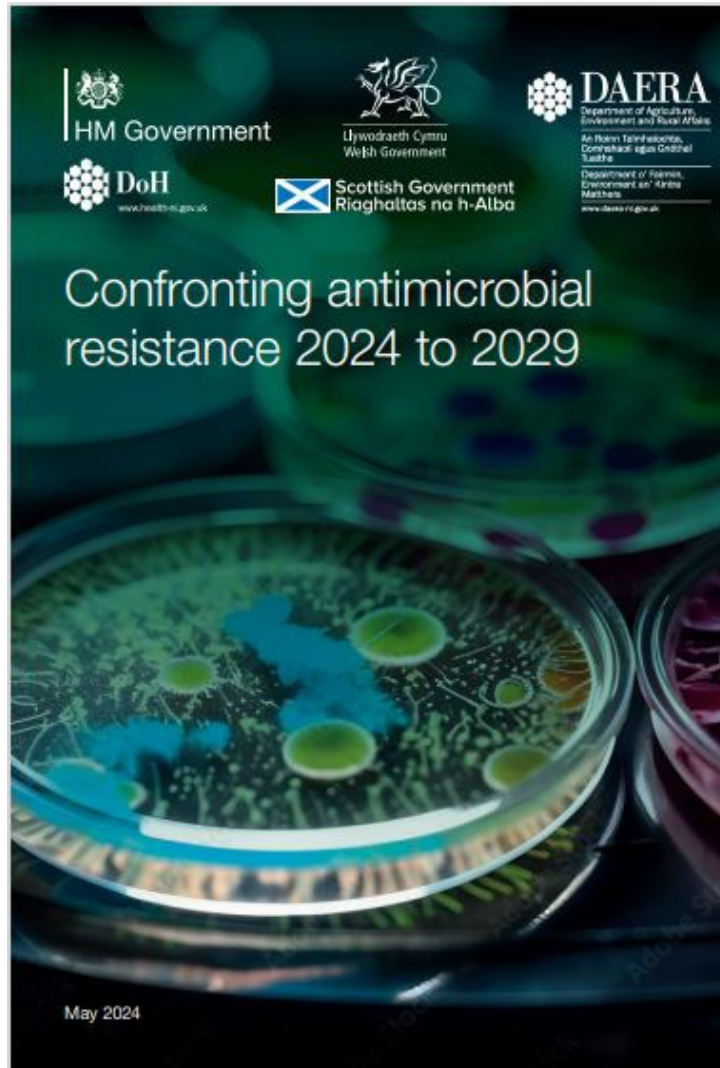
TARGET stands for Treat Antibiotics Responsibly, Guidance, Education and Tools. It is a toolkit designed to support primary care clinicians to champion and implement antimicrobial stewardship activities. The resources can also be used to support CPD and revalidation requirements.

[Sign up to the TARGET contact list](#)

[Take our short survey to improve your online experience](#)



Theme 2 - Optimising the use of antimicrobials



Outcome 4 - Antimicrobial stewardship and disposal

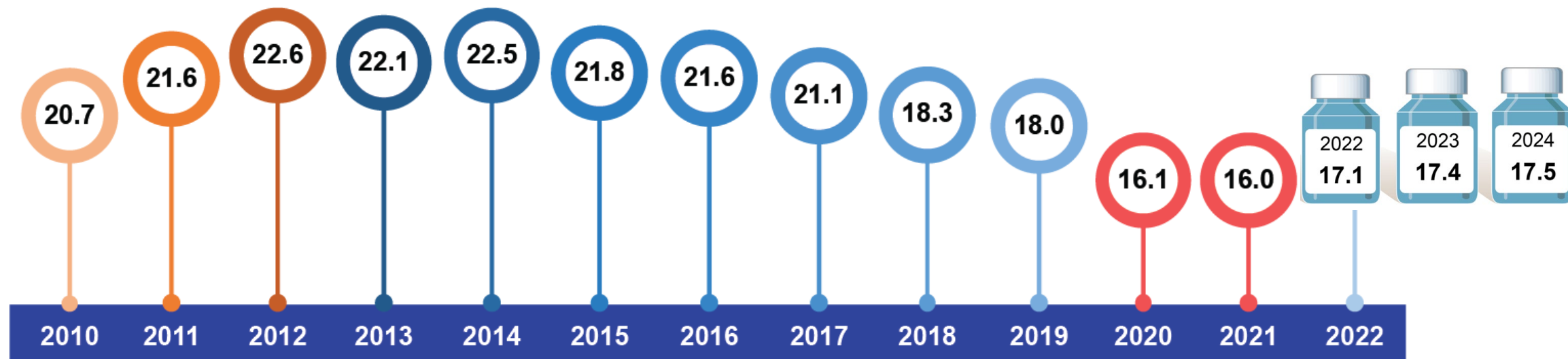
By 2029, the UK has strengthened antimicrobial stewardship and diagnostic stewardship by improved targeting of antimicrobials and diagnostic tools for humans, animals and plants, and improved the disposal of antimicrobials, informed by the right data, risk stratification and guidance.

This outcome has:

- 3 commitments:
 - clinical decision support
 - appropriate prescribing and disposal
 - behavioural interventions
- 2 human health targets (see appendix B):
 - target 4a: by 2029, we aim to reduce total antibiotic use in human populations by 5% from the 2019 baseline
 - target 4b: by 2029, we aim to achieve 70% of total use of antibiotics from the Access category (new UK category) across the human healthcare system

Antimicrobial Consumption Chapter timeline:

Total antibiotic prescribing in England from 2010-2022
(DDDs per 1,000 inhabitants per day)



Increasing antibiotic consumption trend

ESPAUR 1st publication. Included AMC reporting

Impact of Quality Premium on total and broad-spectrum prescribing in primary care

Another QP for primary care, and Commissioning for Quality and Innovation (CQUIN) for secondary care introduced

The COVID-19 pandemic

iGAS outbreak

Improved data access: inclusion of dental and other community prescribing

Secondary care speciality-level prescribing data became available to ESPAUR

Change to DDD calculations

A new five-year National Action Plan (NAP)

2021-22: Inclusion of antifungal, antiparasitic and antiviral surveillance within the chapter

WHO alterations of Defined Daily Doses measurements 2019

Adapted AWARe categories for England

The Antibiotic Guardian Campaign



Launched in 2014 by PHE (now UKHSA) as part of the European Antibiotic Awareness Day. Started as a national campaign but became global

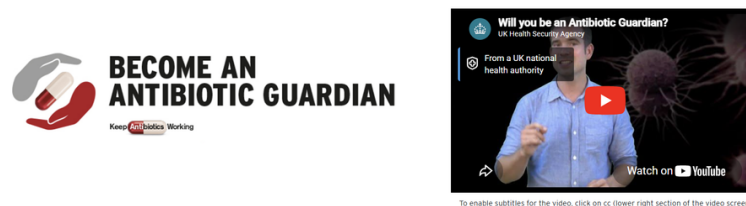
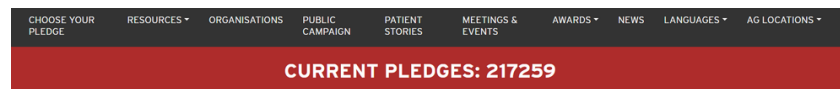


Aims to raise awareness and promote responsible stewardship of antimicrobials – building knowledge and driving behavioural change among HCPs, students and the public.



Developed using behavioural science approach “if-then” intentions
Encourages individuals and organisation to make a pledge – a simple, public commitment to one action that helps keep antibiotics working.

Keep Antibiotics Working



Antibiotic resistance remains one of the biggest threats facing us today.

Why it is relevant to you:

without effective antibiotics many routine treatments will become increasingly dangerous. Setting broken bones, basic operations, even chemotherapy and animal health all rely on access to antibiotics that work.

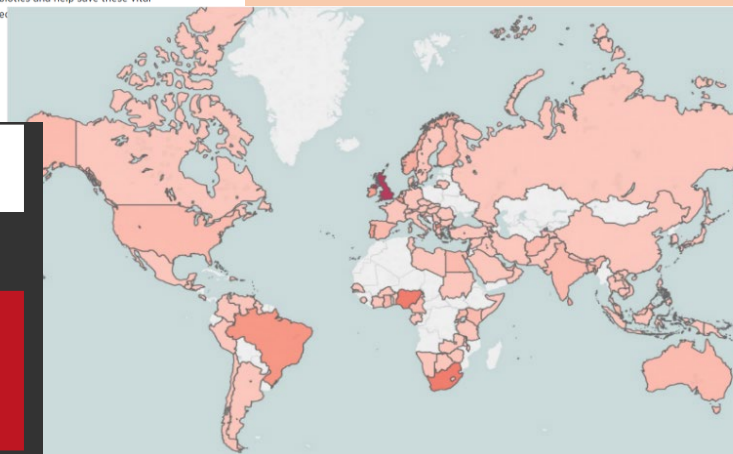
What we want you to do:

It is important to remember that antibiotics do not treat or prevent viruses, including the one that causes COVID19. To slow resistance we need to cut the unnecessary use of antibiotics. We invite the public, students and educators, farmers, the veterinary and medical communities and professional organisations, to become Antibiotic Guardians.

Call to action:

Choose one simple pledge about how you'll make better use of antibiotics and help save these vital medicines from becoming useless.

>210,000 pledges from 192 countries



I AM A

HEALTH OR SOCIAL CARE PROFESSIONAL OR LEADER	MEMBER OF THE PUBLIC	STUDENT, EDUCATOR OR SCIENTIST
- Select from the list - - Select from the list - Antimicrobial/Infection Prevention Dentists Executives/Management/Governors UK & International organisations Midwives Nurses Other HCPs (eg Podiatrists, chiropodists, radiographers, therapists, social workers, non-medical) Pharmacy Teams Primary Care Prescribers Secondary Care Prescribers Veterinary & Nurses Teams Farm Adviser Local Authorities / Public Health Teams	- Select from the list - - Select from the list - Adults Families Farmers Pet/Horse Owners	- Select from the list -



Campaign Components

Antibiotic Guardian Shared Learning Awards



Antibiotic Guardian Schools Ambassadors

Antibiotic Guardian Schools Ambassadors

School Survival Guide

A toolkit for teachers and Antibiotic Guardian schools ambassadors to deliver antibiotic awareness sessions in schools during

World Antimicrobial resistance Awareness Week
18-24 November

European Antimicrobial Awareness Day
18 November

<https://antibioticguardian.com/schools-ambassadors-registration-feedback/>



Antibiotic Guardian translated pledges



Antibiotic Guardian Newsletter



Antibiotic Guardian Updates

Welcome!

Welcome to the fourth edition of the quarterly Antibiotic Guardian newsletter!

In this edition we cover:

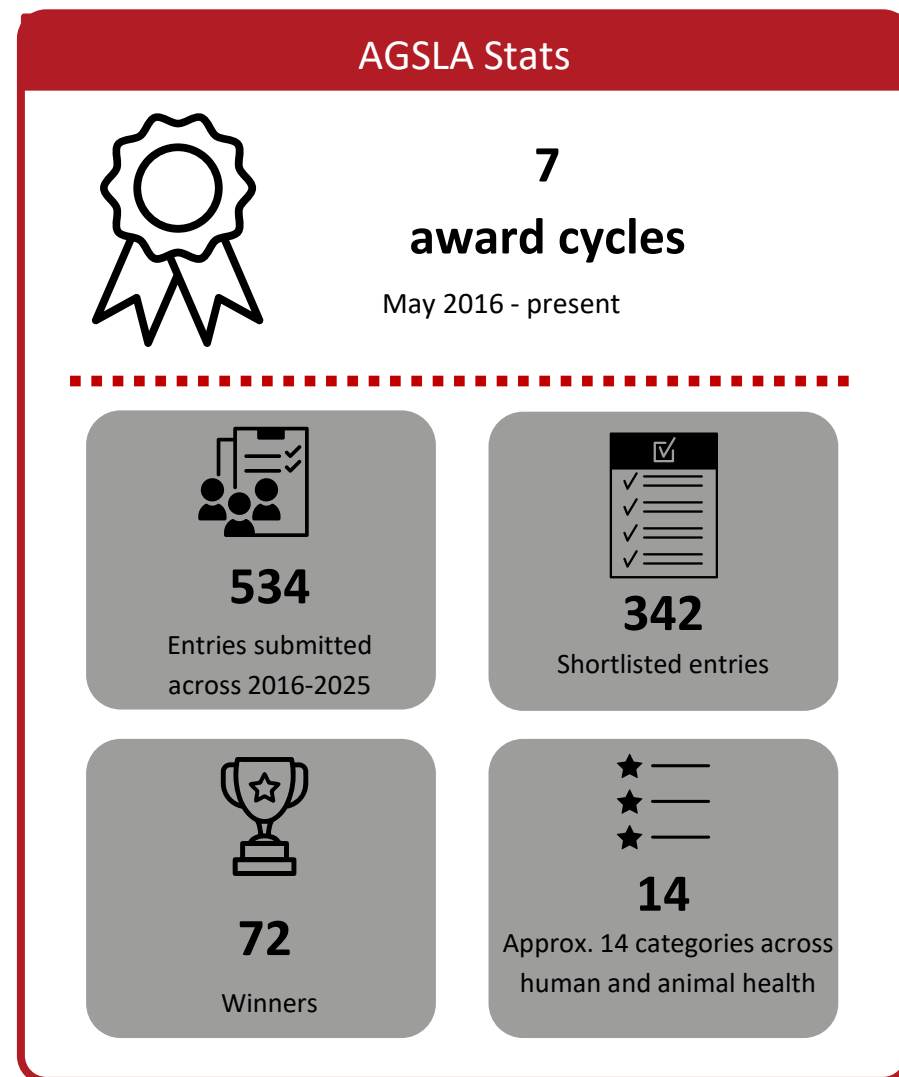
- Updates to the World AMR Awareness Week Toolkit
- The upcoming 2024-2025 ESPAUR Report
- Phase two of the Keep Antibiotics Working Campaign
- WAAW and AMS events
- And more – future events and resources

Current Pledges: 213,181



Antibiotic Guardian Shared Learning Awards: Recognising Innovation and Good Practice

- Launched in 2016, The Antibiotic Guardian Shared Learning Awards aims to recognise and celebrate projects that tackle AMR, carried out by individuals, teams, and organisations across the UK and beyond and to share learning from them.
- Awards ceremony was held annually from 2016 to 2020 and has been biennial since then.
- Open across multiple categories - including animal health, children, and infection prevention and control.
- Entries are assessed, with shortlisted submissions uploaded to the shared learning pages, and winners celebrated at an in-person awards ceremony.



Translation of Antibiotic Guardian pledges

- Since 2014, Antibiotic Guardian pledges have been translated to widen global reach - starting with Russian, Dutch, French, Turkish and Welsh (in partnership with WHO Europe and the Belgian Antibiotic Policy Coordination Committee (BAPCOC))
- In 2025, as part of UK action on health inequalities, pledges were translated into Urdu, Punjabi, Mandarin, Polish and Romanian through collaboration with the EPSRC Digital Health Hub for Antimicrobial Resistance.



Catalysing action across a range of communities: children centres; hospitals; community pharmacies, companies

Awareness and engagement in Hospitals, community pharmacies, universities, organisations in all UK Countries



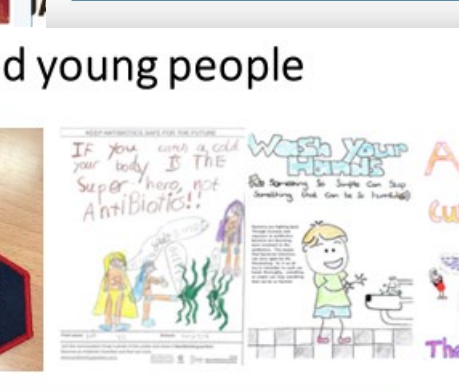
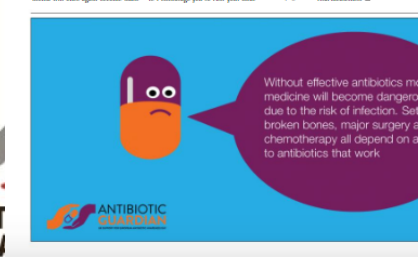
Engagement via social media – e.g pictures tweeted with #AntibioticGuardian



Why is there such a focus on antibiotic resistance at the moment?

The focus stems from the fact that many of our precious medicines have lost their effectiveness to treat the bacteria which causes common infections, such as pneumonia, skin and kidney infections, gonorrhoea and tuberculosis

Prescription of antibiotics is a double-edged sword. On the one hand, they are essential for treating many infections. On the other hand, their overuse and misuse has led to the development of antibiotic resistance. This is a global health threat, as it means that many of the infections we once treated with antibiotics are now becoming harder to treat. The World Health Organization (WHO) has declared antibiotic resistance as one of the top 10 global health threats of the 21st century. The focus on antibiotic resistance is therefore a response to the growing threat of this global health issue.



Catalysing actions beyond Europe



ibli
Asi

Development and pilot evaluation of an educational programme on infection prevention and antibiotics with English and Scottish youth groups, informed by COM-B

Catherine V Hayes, Charlotte V Eley, Diane Ashiru-Oredope, Magda Hann and Ciódna AM McNulty on behalf of the Antibiotic Guardian Youth Badge working group

Keep Antibiotics Working



Students have taken action

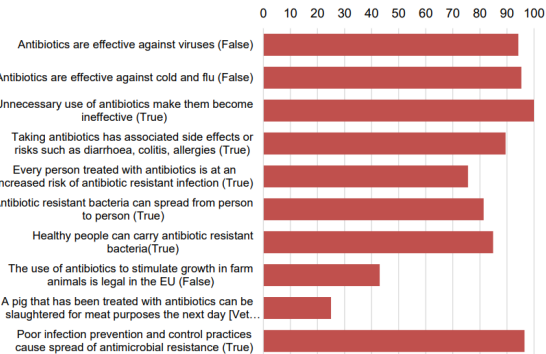
- National AMR students conference was Initiated by a pharmacy student in his 3rd year
- Run annually since 2017 and seeks to bring together students from multidisciplinary backgrounds (medicine, biomedical sciences, dental, veterinary, nursing etc.) to learn about tackling AMR collaboratively in 'real life'
- Run virtually in 2020 and adapted into an 'on-demand' module course in 2021
- Pharmacy students at UCL SOP have created multilingual education videos



Article
Assessing the Knowledge, Attitudes and Behaviors of Human and Animal Health Students towards Antibiotic Use and Resistance: A Pilot Cross-Sectional Study in the UK

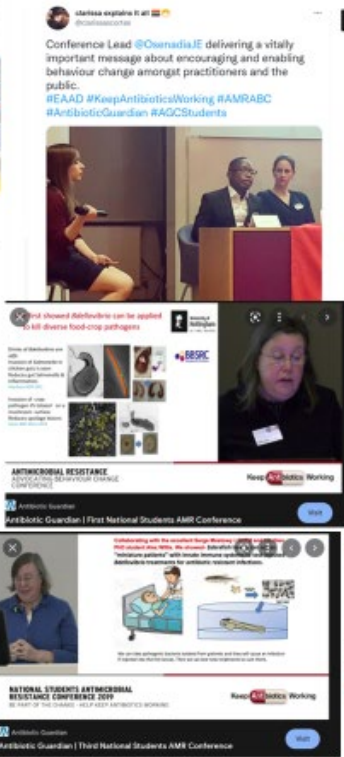
Oliver James Dyar¹, Holly Hills², Lara-Turiya Seitz³, Alex Perry⁴ and Diane Ashiru-Oredope^{4,5,*}

Figure 7.5. Post conference responses to Knowledge Assessment showing percentage correct responses



Modules in 2021:

- Human Health in tackling AMR
- Animal Health in tackling AMR
- Dental perspectives on AMR
- Clinical trials & Vaccines
- Innovation in tackling AMR
- Behaviour Change & Quality Improvement
- Multidisciplinary approaches to AMR



Lectures available online

UCL SOP WAAW Multilingual Video ...

Pharmalliance UCL Student Domain - 1 / 13

- UCL SOP WAAW Multilingual Video Project - English
- UCL SOP WAAW Multilingual Video Project - French
- UCL SOP WAAW Multilingual Video Project - Mandarin
- UCL SOP WAAW Multilingual Video Project- Pashto
- UCL SOP WAAW Multilingual Video Project - Persian
- UCL SOP WAAW Multilingual Video Project- Polish
- UCL SOP WAAW Multilingual

National Students' AMR Conference

Saturday 21st November 10.30am (Virtual Event)

The fourth multi-disciplinary national students' conference on antimicrobial resistance hosted by Public Health England

Focusing on 4 main topics:

- ❖ Tackling AMR across human & animal health
- ❖ AMR as part of a Multi-Disciplinary Team
- ❖ Quality Improvement & Behavioural Change
- ❖ COVID-19 - Clinical Trials & Vaccinations

Chaired By: Dr Diane Ashiru-Oredope (PHE)

Be part of the change – Help Keep Antibiotics Working

Register your place via:

<https://antibioticguardian.com/Meetings/nsamrc-2020/>

#AntibioticGuardian #TheNSAMRC

espauro@phe.gov.uk

In Collaboration With
Public Health England
Supported By
Health Education England
Antimicrobial Resistance Campaign

Evaluating the campaign

Chaintarli et al. BMC Public Health (2016) 16:393
DOI 10.1186/s12889-016-3057-2

BMC Public Health

RESEARCH ARTICLE

Open Access



Impact of a United Kingdom-wide campaign to tackle antimicrobial resistance on self-reported knowledge and behaviour change

Katerina Chaintarli^{1,2*}, Suzanne M. Ingle², Alex Bhattacharya³, Diane Ashiru-Oredope³, Isabel Oliver^{1,2} and Maya Gobin^{1,2}

Journal of Public Health | Vol. 39, No. 2, pp. e40–e47 | doi:10.1093/pubmed/fdw059 | Advance Access Publication July

A process evaluation of the UK-wide Antibiotic Guardian campaign: developing engagement on antimicrobial resistance

Alex Bhattacharya¹, Susan Hopkins¹, Anna Sallis², Emma L. Budd¹, Diane Ashiru-Oredope¹

¹Public Health England, AMR Programme, SE1 8UG, London, UK

²Public Health England, Behavioural Insights, SE1 8UG, London, UK

Address correspondence to Diane Ashiru-Oredope, E-mail: Diane.Ashiru-Oredope@phe.gov.uk

RESEARCH ARTICLE

Open Access



The Antibiotic Guardian campaign: a qualitative evaluation of an online pledge-based system focused on making better use of antibiotics

Joanna May Kesten^{1,2*}, Alex Bhattacharya³, Diane Ashiru-Oredope³, Maya Gobin^{1,4} and Suzanne Audrey⁵

Keep Antibiotics Working



Article

Demographic, Knowledge and Impact Analysis of 57,627 Antibiotic Guardians Who Have Pledged to Contribute to Tackling Antimicrobial Resistance

Sophie Newitt^{1,†}, Olaolu Oloyede^{2,†}, Richard Puleston¹, Susan Hopkins² and Diane Ashiru-Oredope^{2,*}

Pilot phase and analysis of AMR knowledge 437

The European Journal of Public Health, Vol. 28, No. 3, 437–439

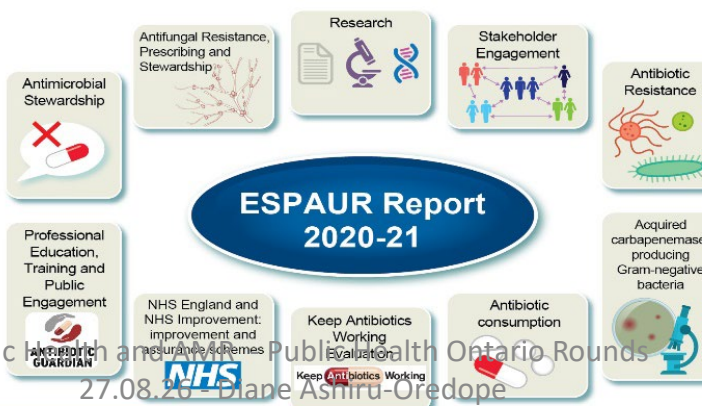
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doi:10.1093/ejpub/ckx239 Advance Access published on 1 February 2018

Expansion of the 'Antibiotic Guardian' one health behavioural campaign across Europe to tackle antibiotic resistance: pilot phase and analysis of AMR knowledge

Sophie Newitt¹, Sibyl Anthierens^{2,3}, Samuel Coenen^{2,3}, Danilo Lo Fo Wong⁴, Cristiana Salvi⁴, Richard Puleston^{1,5}, Diane Ashiru-Oredope¹



Public Health and Antimicrobial Resistance Public Health Ontario Rounds
27.08.2016 Diane Ashiru-Oredope

UKHSA ESPAUR Report 2020-21

“AGs were motivated to reduce AMR and most felt they fulfilled their pledges”

“the campaign increased commitment to tackling AMR in both healthcare professional and member of the public, increased self-reported knowledge and changed self-reported behaviour particularly among people with prior AMR awareness.”

“Members of the public were more likely to act in line with their pledge than professionals (Odds Ratio (OR) =3.60, 95 % Confidence Interval (CI): 2.88-4.51)”



ANTIBIOTIC
GUARDIAN

UKHSA's national campaign for the public: Keep Antibiotics Working (AndiBiotic)



UK Health Security Agency
22.1K subscribers

antimicrobial resistance (AMR) m...

Copy link

From a UK national health authority

Join **Andi Biotic's** mission and help keep antibiotics working



Watch on  YouTube



How to keep antibiotics working

- Don't take antibiotics for colds and flu. They won't work.
- Don't save leftover antibiotics for later, they don't work.
- Take them as directed by your GP, nurse or pharmacist.

KEEP ANTIBIOTICS WORKING

Scan the QR code to find out more

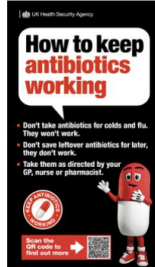




The UKHSA Keep Antibiotics Working campaign runs alongside WAAW, with the mascot Andi Biotic who is on a mission to help the public understand the responsible ways to use antibiotics.

Predominantly run as social media campaign alongside partnerships e.g. Gyms, Community Pharmacies

Resources

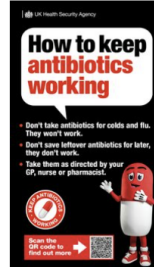


How to keep antibiotics working

Posters

A3 & A4 antimicrobial resistance posters in English.

Last updated: 23 March 2026



How to keep antibiotics working

Posters - translated

A3 & A4 posters translated into 29 different languages

Last updated: 23 March 2026



How to keep antibiotics working

Digital screens

9x16 & 16x9 antimicrobial resistance digital screens in English.

Last updated: 23 March 2026

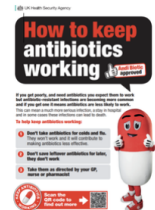


How to keep antibiotics working

Digital screens - translated

Digital screens outlining information about antimicrobial resistance, translated into 29 languages.

Last updated: 23 March 2026



How to keep antibiotics working

A5 leaflets

A5 antimicrobial resistance leaflets in English.

Last updated: 23 March 2026



How to keep antibiotics working

A5 leaflets - translated

A5 leaflet providing

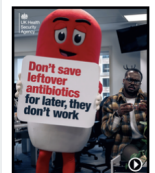


Don't take antibiotics for colds and flu

Behaviour Films

A set of three videos for use on social media channels. The videos are part of UKHSA's AMR Keep Antibiotics Working campaign

Last updated: 23 March 2026



Don't save leftover antibiotics for later, they don't work

Short form social media videos

Our three short form social media videos show Andi intervening in the nick of time to prevent antibiotics being misused.

Last updated: 23 March 2026



Don't take antibiotics for colds and flu

Hero video

Our new campaign hero video sees Andi Biotic helping our friendly community pharmacist.

Last updated: 23 March 2026



Take antibiotics as directed by your GP, nurse or pharmacist

Social media gifs

Our set of social media gifs are the perfect accompaniment to both the hero videos and the short form social media videos.

Last updated: 23 March 2026

Partnership is key: ESPAUR stakeholders, partners and contributors: regulators, professional bodies, public health bodies, private sector (data and hospitals)



Scottish One Health
Antimicrobial Use and
Antimicrobial
Resistance (SONAAR)

BNF
British National Formulary

NICE National Institute for
Health and Care Excellence



March 2026



Examples of activities undertaken by ESPAUR Oversight Group members to support the UK National Action Plan for AMR 2024-29

Theme: Global partner
Outcome: AMR diplomacy
Commitment: 9.2, Access and stewardship

Undertaking Global Antimicrobial Stewardship Accreditation Scheme to support hospitals globally with quality improvement to develop and potentially become a Centre of Excellence for AMS.

Theme: Optimising the use of antimicrobials
Outcome: AMR workforce
Commitment: 5.1, Health and Social Care training

Delivering professional educational programmes on the prevention of infection, aligned to AMS.

Theme: Optimising the use of antimicrobials
Outcome: Antimicrobial Stewardship and disposal
Commitment: 4.1, Clinical decision support

Collaborating with UKHSA to implement the TARGET antibiotics toolkit to support primary care providers to effectively utilise AMS interventions.

Theme: Global partner
Outcome: AMR diplomacy
Commitment: 9.2, Access and stewardship, 9.5, Advocacy and engagement

Collaborating with international governments and with World Health Organisation SEARO to present the activities and future direction for dental activities to tackle AMR, and support stewardship.



Public Health and AMR - Public Health Ontario Rounds
27.08.26 - Diane Ashiru-Oredope



UK Health
Security
Agency

National to Regional and Local Actions to address AMR

National Report includes regional and local system level breakdowns. Local teams mobilise knowledge through health systems and to the public

Figure 2.3. Geographical distribution in rate per 100,000 population of the (a) estimated burden of AMR and (b) estimated rate of bacteraemia by Integrated Care Board (n = 42), in England 2024

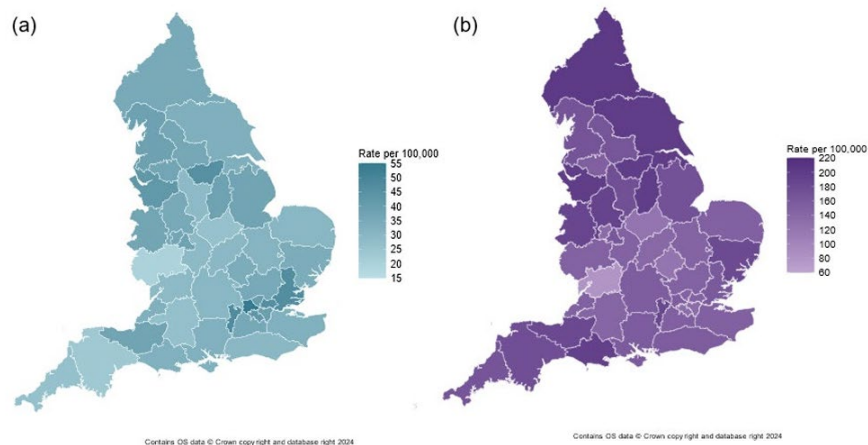
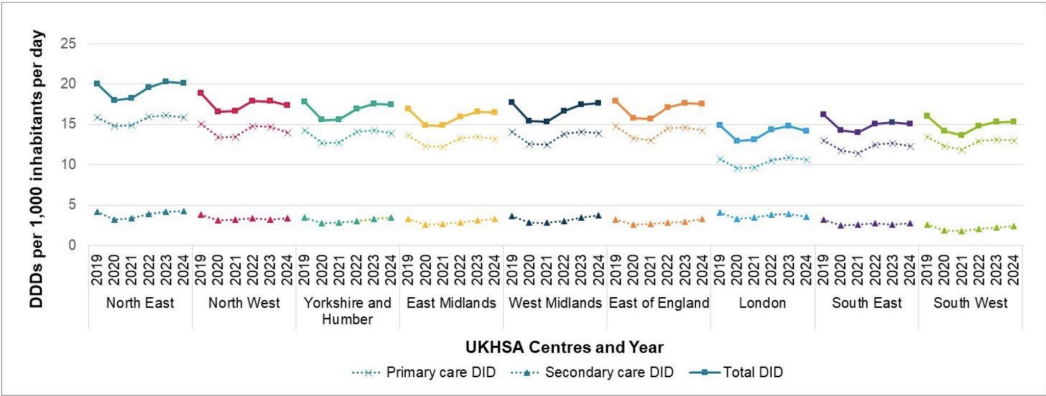


Figure 7: Total, NHS primary and secondary care antibiotic consumption by UKHSA centres, expressed as DID, 2019 to 2024 (excludes dental practice data) [note 1]
[Note 1] Primary care data does not include dental care prescribing as UKHSA centre-level data was not available at the time of production. The order of UKHSA centres presented is based on geographic location from North to South of England.



Residents urged to use antibiotics wisely as figures reveal rise in resistant infections in West Midlands

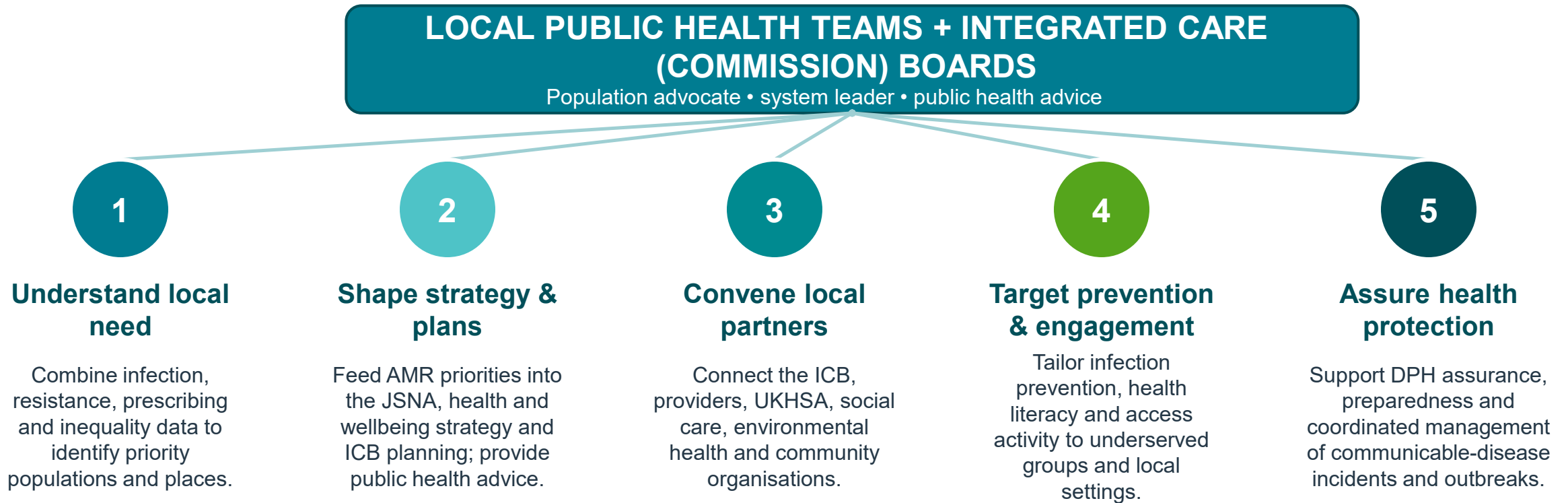


N > News > Health > NHS

Symptoms of antibiotic-proof infection hitting England as deaths up more than 300

The UK Health Security Agency (UKHSA) has raised concerns after the number of deaths from an antibiotic-resistant superbug soared in the last 12 months

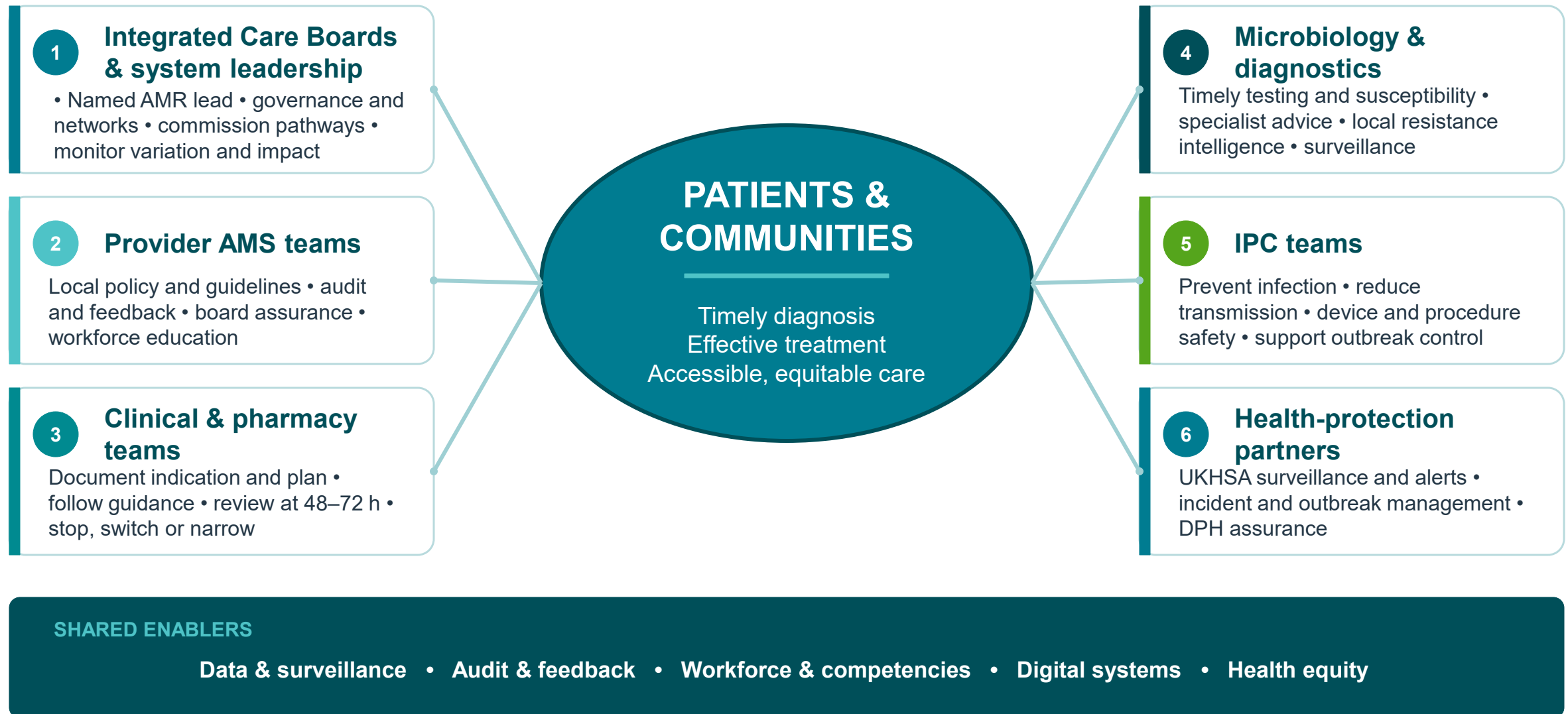
Local public health teams turn AMR data into place-based action



PLACE-BASED AMR OUTCOMES

Fewer preventable infections • More equitable access • Safer antimicrobial use • Stronger outbreak readiness

Range of roles local teams take to turn AMR strategy into safer care



UKHSA local public health teams turn national AMR priorities into regional action

The UKHSA North-West Case Study

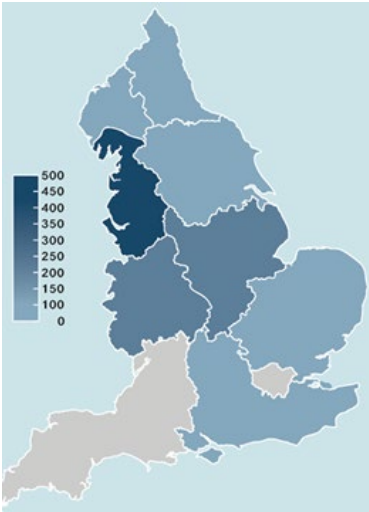
Annual planning and partnership with NHS England North-West support five connected workstreams



Training in action to implement national tools/priorities

- ✓ **C. difficile seminar**
Regional action planning and coordinated response with NHS partners
- ✓ **e-Bug train-the-trainer**
Delivered across 3 sub-regions; representatives from 17 upper-tier local authorities
- ✓ **TARGET Antibiotics Toolkit - train-the-trainer**
Delivered across all 3 North West sub-regions – 2,432 primary care clinicians trained across England (944 in NW region)
- ✓ **Epidemiology capability**
Annual course plus a needs assessment for HCAI surveillance and outbreak investigation

UK Health Security Agency
Clostridioides difficile infection
 Updated guidance on management and treatment

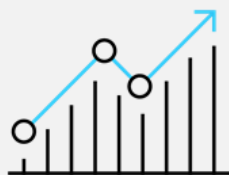


Regional leadership connects surveillance, improvement, engagement and workforce development to delivery of the AMR National Action Plan.

Advancing Antimicrobial Stewardship: The Role of Local Public Health Organizations

A Scoping Review

High-Impact AMS Activities



Data Driven Interventions



Partnership & Collaboration



Outreach & Education

Local public health plays a key role in knowledge dissemination, data collection & analysis as well as the design and implementation of AMS design & intervention.

63 Citations Identified

Peer-reviewed and grey literature from OECD countries published from 1999 to November 2023.

122 Examples of AMS & AMR surveillance activities

The most common activities identified were education, antimicrobial use evaluation and the development & dissemination of clinical practice guidelines and antibiograms.

Summary

Coordinated local public health efforts can increase the implementation of effective antimicrobial stewardship (AMS) activities. Leveraging local public health capabilities can help scale and expand AMS initiatives. Future research should examine the barriers and facilitators to optimize participation of local public health organizations in mitigating antimicrobial resistance (AMR).

Developing tailored e-learning for public health (health protection) teams/practitioners

European Journal of Public Health, Vol. 34, No. 5, 895–901

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<https://doi.org/10.1093/ejpub/ckae086> Advance Access published on 17 May 2024

Designing, piloting and evaluating (through a matched pre- and post-implementation survey) a targeted e-learning resource on antimicrobial resistance for public health professionals

Hannah M. Taylor ^{1,2,3}, Rachel A. Mearkle¹, Rita A.M. Huyton⁴, Diane Ashiru-Oredope ⁵

1 South East Health Protection Team, UKHSA, Oxford, UK

2 UK Field Epidemiology Training Programme, UKHSA, London, UK

3 Public Health, Headquarters Army Medical Services, Camberley, UK

4 Health Equity and Inclusion Division, UKHSA, London, UK

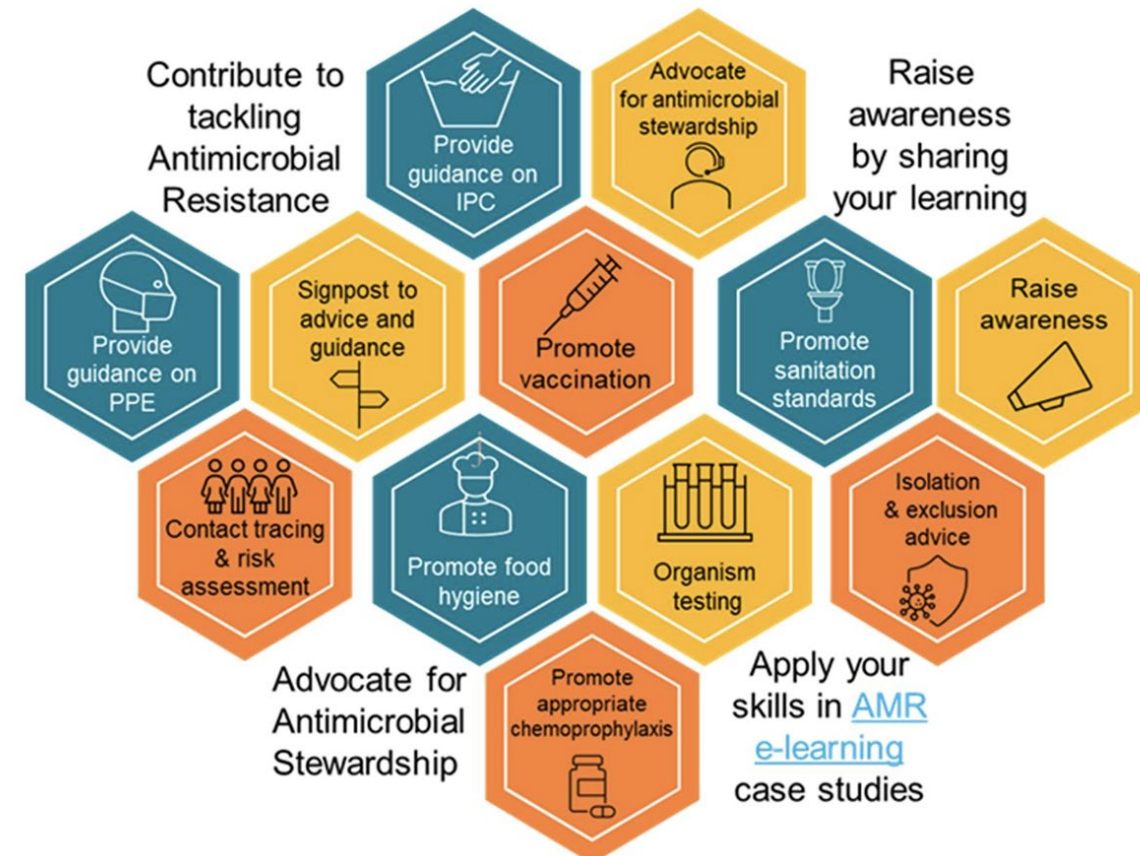
5 HCAI, Fungal, AMR, AMU & Sepsis Division, UKHSA, London, UK

Correspondence: Hannah M. Taylor, SE HPT, UKHSA, Fermi Ave, Harwell Campus, Chilton, Oxfordshire, OX11 0RQ, UK, Tel: 0344 225 3861, e-mail: hannah.taylor@ukhsa.gov.uk

Background: Antimicrobial resistance (AMR) is a significant global public health threat and key priority for the public health, especially health protection, workforce to lead by example. There is a paucity of learning resources on this for public health professionals (PHPs) in the UK. This project aimed to develop and disseminate a tailored interactive learning resource and evaluate impact on self-reported intention to change behaviour. **Methods:** Learning objectives were agreed, content developed by the multi-disciplinary team and piloted by PHPs in 2022 alongside a matched pre- and post-implementation evaluation survey. Questions were mapped to the capability–opportunity–motivation–behaviour change model. Before and after responses were calculated to compare change in self-reported knowledge, understanding and behaviour. Significance of change in binary responses was estimated. **Results:** The resource was delivered using an interactive, user-friendly and cost-free internal platform. Thirty-one PHPs completed the pilot e-learning and survey. Perceived and actual knowledge increased in parallel. Actual knowledge on AMR burden increased from 6.45 to 35.48% ($P = 0.004$). Self-reported confidence to explain AMR to others improved by 0.71 (95% CI: 0.38–1.04; $P = 0.0001$) Likert points on a five-point scale. Motivation to advocate for antimicrobial stewardship (AMS) in day-to-day work, improved by 0.71 (95% CI: 0.34–1.08; $P < 0.00001$) Likert points. Case scenarios were well-received as an effective way to apply theory to practice. **Conclusion:** Ensuring a well-informed and confident public health workforce is vital for reducing the AMR threat and advocating for AMS with the public and partner organizations. This targeted e-learning module is an effective additional learning medium in contributing to PHPs knowledge, understanding and self-reported intention to change behaviours.

Antimicrobial Resistance (AMR) e-learning module for UKHSA staff

Actions for Public Health and Health Protection Professionals

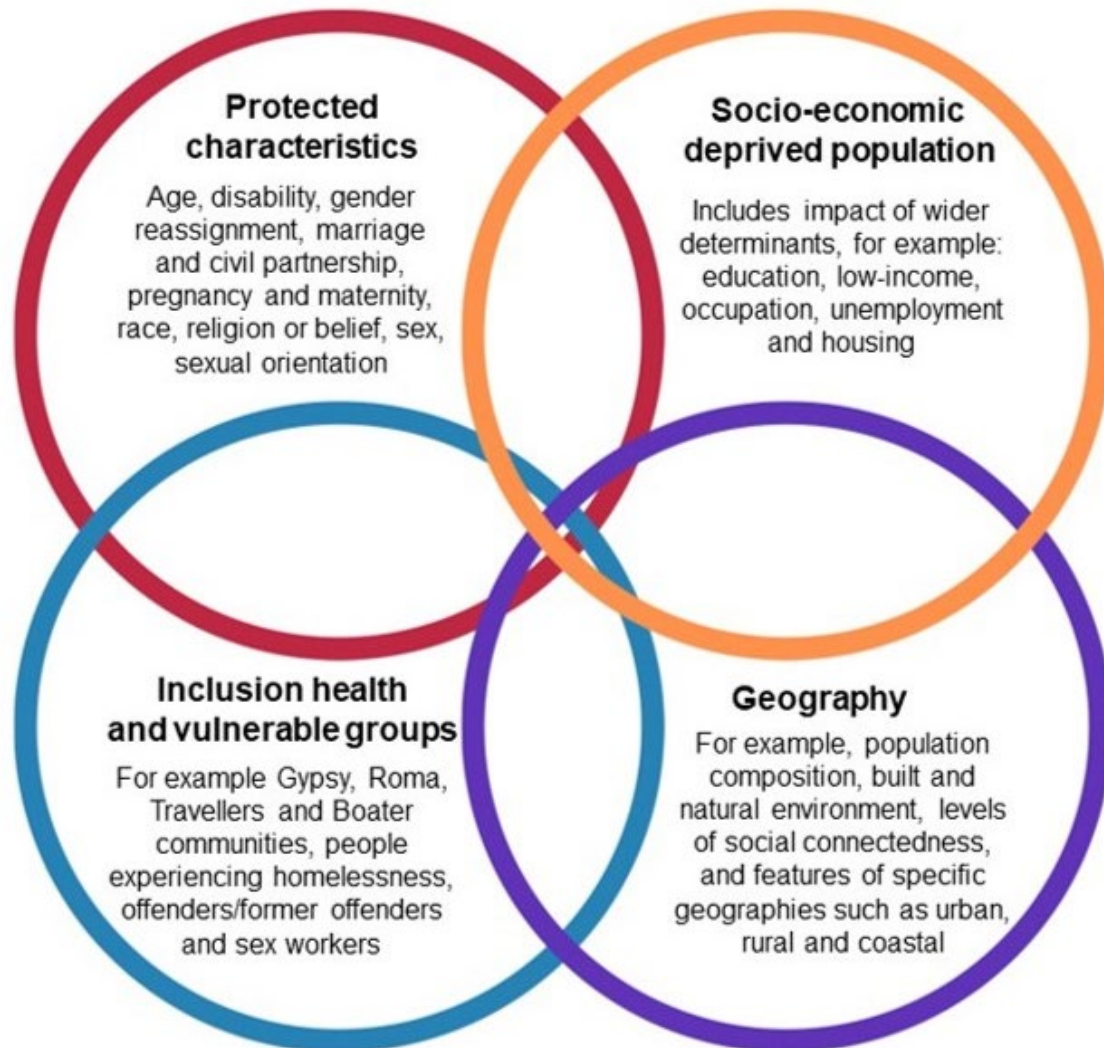




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Addressing Health Inequalities in AMR

Factors commonly associated with/assessed in the context of health inequalities



Root causes: a systems view

Structural

Housing & overcrowding · Food insecurity · Environmental exposure
· Immigration status

System

Under-resourced health provision in deprived areas · Access gaps
· Resource inequity

Provider

Implicit bias in clinical decisions · Diagnostic anchoring
· Communication barriers

Patient

Delayed help-seeking · Language barriers
· Mistrust of services · Higher comorbidity burden

Addressing AMR inequalities now embedded in surveillance and policy – our journey so far

A sustained programme connected evidence, equity frameworks and public-health action

2018

Assessed equity

Health Equity Assessment Tool (HEAT) was applied to PHE antimicrobial-resistance projects to identify gaps and improvement needs.

2019

Build a focused programme

Work progressed from understanding inequalities to strategy and recommendations for action (focused work stream).

2022

+

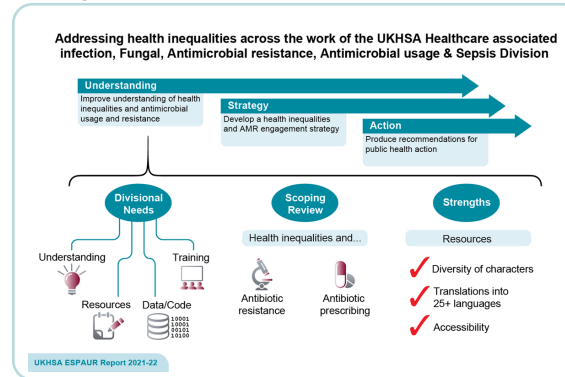
Publish the evidence

ESPAUR highlighted variation in resistant bloodstream infections by ethnicity, deprivation and geography.

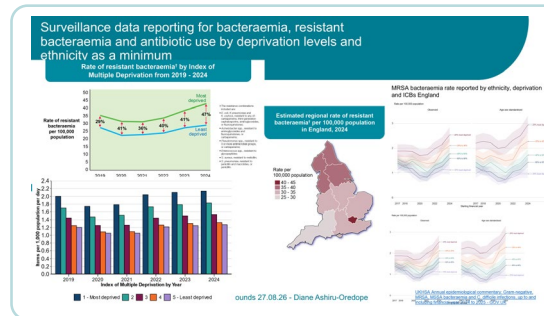
Now

Embed an equity lens

Routine reporting stratifies infection, resistance and antibiotic use; Core20PLUS5 supports targeted NHS action. Aiming to move to interventions to address disparities



Origins and HEAT



Routine surveillance



Prior to developing the 2024-29 National Action Plan for AMR: UKHSA had published clear inequalities in resistant BSIs (ESPAUR report)

Ethnicity

The highest percentage resistance of BSIs was noted in Asian and British Asian ethnic groups (Table 1).

Depression

rates of resistant BSIs were 34% higher in the lowest compared to the highest IMD quintile in 2019; this difference in infection rate increased to 41% in 2022 (33 vs. 24.3 infections/100,000 population) (Figure 1).

Table 1. AMR burden from BSI by ethnic group in England in 2022

Ethnic Group	Rate resistance per 100,000 ethnic population	Percent Resistance (95% confidence intervals)
White	28.1	18.7 (14.8 – 18.9)
Asian or Asian British	26.7	34.6 (32.5 – 38.2)
Black, African, Caribbean or black British	24.6	29.5 (23.7 – 27.2)
Mixed or mixed ethnicity	6.4	19.2 (16.6 – 23.8)
Any other ethnic group	4.7	18.7 (14.3 – 23.0)

Geographical Variations

London had the third lowest rate of BSI compared to other regions in England (14.1 infections/100,000 population) (Figure 2b).

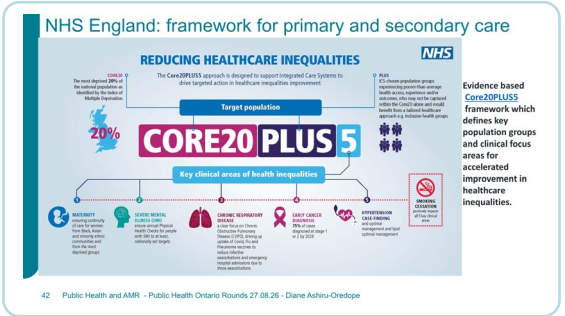
The rate of resistant BSI was highest in London (32.3 infections/100,000 population) and the highest of any region in the UK (Asian or Asian British population) and the third highest rate of OXA-48-like infections (3,310/100,000 population).

Figure 1. Variation by index of multiple deprivation in the rate of resistant BSI in England in 2019 and 2022

IMD Quintile	2019 Rate	2022 Rate
1 (most deprived)	35	30
2	33	29
3	33	26
4	31	27
5 (least deprived)	29	24.3

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ESPAUR evidence



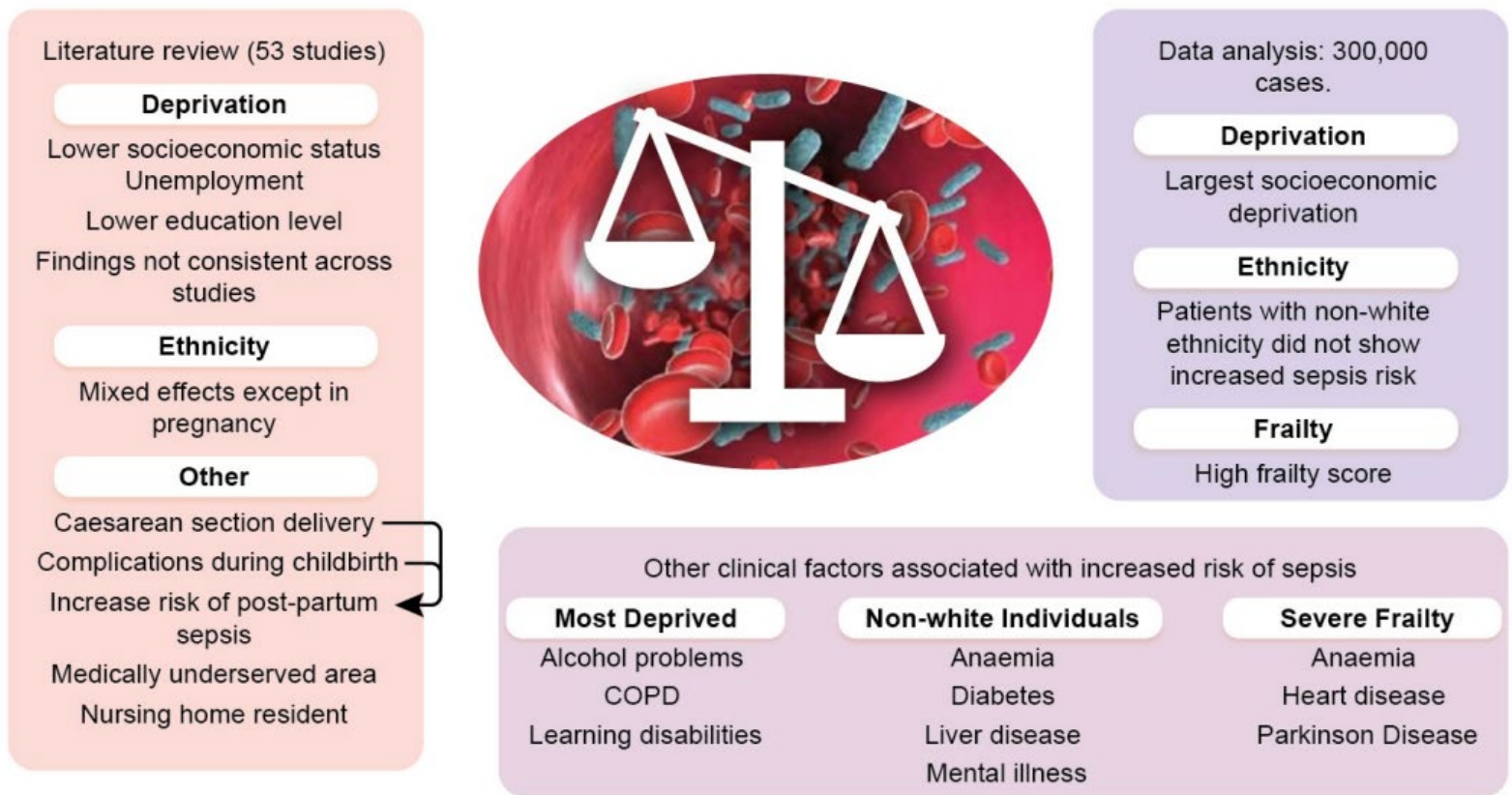
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NHS equity framework

The shift was not a single initiative: equity became part of how AMR is assessed, measured, interpreted and acted upon.

Academic Partnership with University of Manchester

Assessing the interplay between factors commonly associated with health inequalities, clinical factors, and sepsis incidence and outcomes



Zhong X, Ashiru-Oredope D, Bladon S, Cunningham N, Gilham E, Brown C, Mirfenderesky M, van Staa T *et al.* The influence of factors commonly known to be associated with health inequalities on risks and outcomes of sepsis: rapid literature review and large-scale data analyses. 2023

Study reveals the people most likely to die from sepsis

Other groups more at risk included people who have a history of extensive antibiotic exposure and those with learning difficulties

thena Stavrou

Friday 24 November 2023 03:32 GMT

Comments

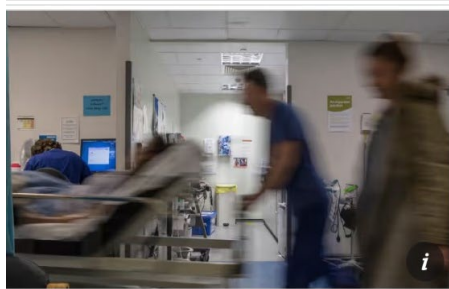
Facebook Twitter WhatsApp Email

OICANADIAN



Sepsis: People with chronic illness or learning disabilities more likely to die from infection, scientists warn

UK News



Sepsis

This article is more than 5 months old

Poor people much more likely to die from sepsis, study finds

Those with existing health problems also at greater risk of condition that kills estimated 48,000 a year in UK

sky news Sky News + Follow

People at higher risk of dying from sepsis identified in scientific study

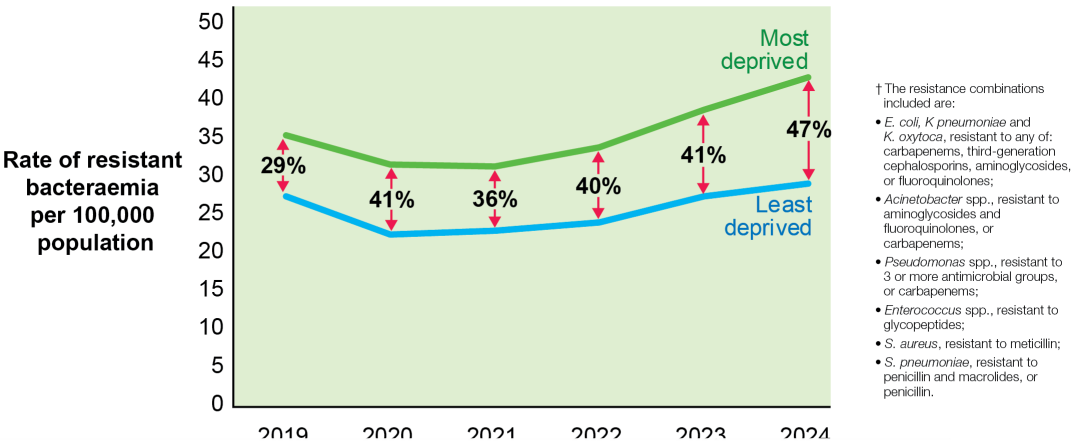
5mo

People suffering from chronic liver and kidney diseases, as well as those with learning disabilities, are at greater risk of dying from sepsis, scientists have warned.

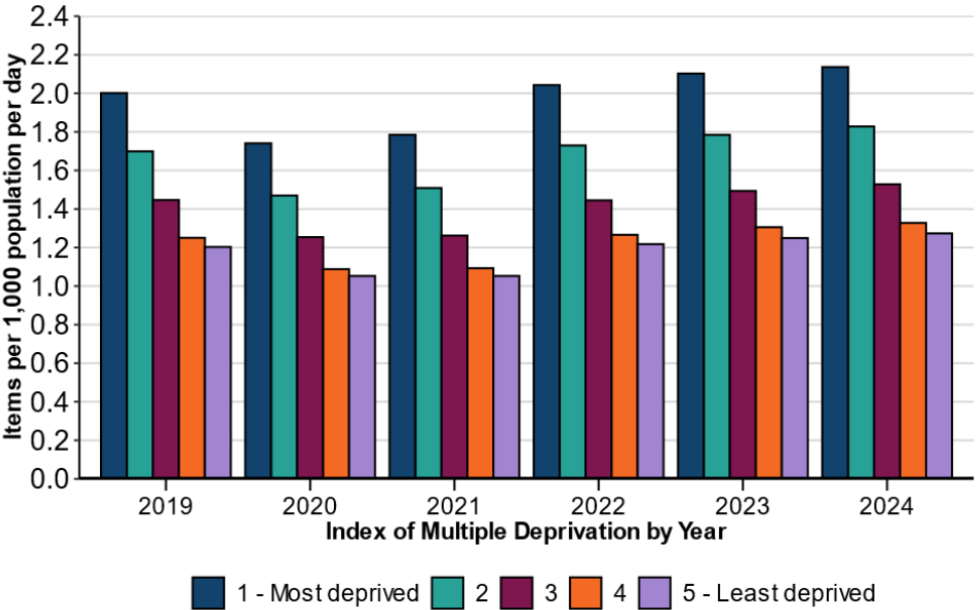
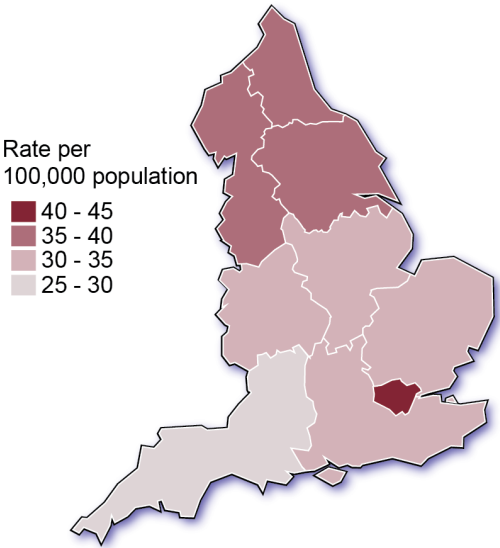


Surveillance data reporting for bacteraemia, resistant bacteraemia and antibiotic use by deprivation levels and ethnicity as a minimum

Rate of resistant bacteraemia† by Index of Multiple Deprivation from 2019 - 2024



Estimated regional rate of resistant bacteraemia† per 100,000 population in England, 2024



MRSA bacteraemia rate reported by ethnicity, deprivation and ICBs England



Developing UK wide commitments to address health inequalities as part of tackling AMR: The Process

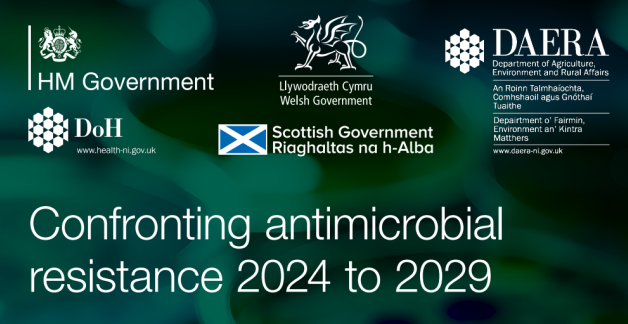
A modified Delphi process built consensus across professions, policy teams and the four UK nations (led by UKHSA)



OUTCOME

Evidence-informed, UK-wide commitments to address health inequalities became part of the 2024–2029 AMR National Action Plan.

2024 – 2029 UK National Action Plan on AMR



9 outcomes and 30 commitments

Infection
Prevention
and Control

IPC &
Biosecurity
Interventions

The Built
Environment

Waste
Management

Global
Action

Prevention &
Preparedness

Access &
Stewardship

Antimicrobial
use in
farming

Manufacturing
Standards

Advocacy &
Engagement

Outcome 8 - Health disparities and health inequalities

By 2029, the UK targets interventions and associated funding where there is the most burden from AMR, where it will have the greatest impact in controlling AMR, and where it will be cost-effective, including targeting specific regions, population groups and settings if appropriate.

This outcome has 3 commitments:

- data on health inequalities
- toolkit for addressing health inequalities
- interventions to reduce health inequalities

Addressing health inequalities in infection and AMR: a UK wide toolkit

Supports UK AMR National Action Plan 2024–2029 — Outcome 8 and Commitment 8.2

Focus: inequalities in access, infection incidence, clinical outcomes, vaccine uptake and antimicrobial exposure

4 UK nations

Co-developed across the UK

86 signposted resources

Evidence, tools, data and examples in one place

3 core sections

Data • practical resources • shared learning

23 population categories

Protected characteristics • social determinants • inclusion health

1 AMR data & dashboards

Find evidence to understand:

- where inequalities exist
- which populations are most affected
- where action should be prioritised
- whether interventions reduce gaps over time

National • regional • local • UK-wide sources

2 Practical resources

Translate identified needs into action using:

- guidelines and structured approaches
- toolkits, assessment tools and flowcharts
- patient information and communication materials
- e-learning and workforce development resources

Search by population • type • language • focus • user

3 Case studies & learning

Learn from practice across different settings:

- how teams identified local challenges
- interventions implemented and adapted
- barriers encountered and lessons learned
- ideas for replication and continuous improvement

Campaigns • co-production • QI • research

NAVIGATE RESOURCES ACROSS 23 POPULATION AND INEQUALITY CATEGORIES

Age • Care leavers & vulnerable young people • Clinical vulnerability • Deprivation • Disability • Ethnicity
Gender • General population • Geography • Gypsy, Roma & Traveller communities • Low health literacy • Marriage/civil partnership
Migrants • Overcrowded/communal housing • Drug/alcohol dependence • Homelessness • Criminal justice • Pregnancy/maternity
Religion/belief • Sex • Sex workers • Sexual orientation • Underserved or disadvantaged populations

◆ GOV.UK

GUIDANCE

Addressing health inequalities in infection and AMR

Data • resources • case studies

IDENTIFY THE GAP → SELECT RELEVANT RESOURCES → ADAPT LOCALLY → IMPLEMENT → MONITOR IMPACT → SHARE LEARNING

Next Phase includes identifying modifiable risk factors and intervention development/scale up

1. What are the **modifiable risk factors and corresponding effective** interventions that can be implemented or scaled up to reduce inequalities in the incidence of resistant blood stream infections and antibiotic use/exposure?
 - a) Systematic Review (ARISE study)
 - b) Analysis of >19million primary care records (IDIARE Study)
 - c) Intervention protocol
2. Scoping review of the contribution of Pharmaceutical Public Health (PPH) in reducing inequalities with resistant infections and antibiotic use/exposure.

NIHR | National Institute for
Health and Care Research

PROSPERO
International prospective register of systematic reviews

Risk factors associated with disparities in antibiotic-resistant bloodstream infections among socioeconomically disadvantaged groups in High-Income Countries

Diane Ashiru-Oredope, Caroline DeBrun, Jack Dukbury Barber, Fran Husson, Sarah Gerver, Matthew Inada-Kim, Colin Brown, Russell Hope

Citation

Diane Ashiru-Oredope, Caroline DeBrun, Jack Dukbury Barber, Fran Husson, Sarah Gerver, Matthew Inada-Kim, Colin Brown, Russell Hope. Risk factors associated with disparities in antibiotic-resistant bloodstream infections among socioeconomically disadvantaged groups in High-Income Countries. PROSPERO 2024 Available from <https://www.crd.york.ac.uk/PROSPERO/view/CRD42024601049>

Research Award: NIHR Senior Clinical and Practitioner Award 2024-28

NIHR | National Institute for
Health and Care Research

UKHSA-Oxford Health Protection Research Unit (2025-2030) in AMR and HCAI

Needs



Better Surveillance



Effective, value for money, interventions



New tools for infection prevention & control



Optimise stewardship



Better routes to diagnostic adoption



Ways to reduce Gram-negative infections

Research Themes

1. Optimising surveillance

- transformative automated surveillance
- advanced analytics using large-scale patient-level national data

2. Establishing population impact

- cost-effectiveness of interventions (e.g. stewardship, diagnostics, IPC, vaccination, surveillance)

3. Advancing stewardship approaches

- optimise stewardship amongst underserved groups
- tailor methods for different primary care contexts and HCPs

4. Mitigating Gram-negative infections

- innovate surveillance to identify drivers and reservoirs for enterobacterales/AMR in healthcare
- define robust intervention strategies

Translational Impacts

Equality, Diversity & Inclusion

Patient & public involvement, engagement and participation

Knowledge mobilisation

Examples of what colleagues in the UK are encouraged to consider:

As a clinician

- Record ethnicity & IMD at every contact — ESPAUR 2024-25 identifies missing data as the key barrier to detecting prescribing inequalities
- Use NHS-commissioned professional interpreters — mandated in NHS Community Languages Framework 2024, not optional
- Apply NEWS2/qSOFA consistently — evidence shows van Staa et al. (2024, England) found deprived patients face significantly higher sepsis risk and mortality

As a team

- Run quarterly AMR/antibiotic use equity audits by ethnicity and IMD.
- Adopt NHSE CORE20PLUS: identify patients from the most deprived 20% and inclusion health groups at every touchpoint
- Partner with voluntary & faith organisations for vaccination outreach — core to UKHSA Immunisation Equity Strategy 2025-30

As an institution

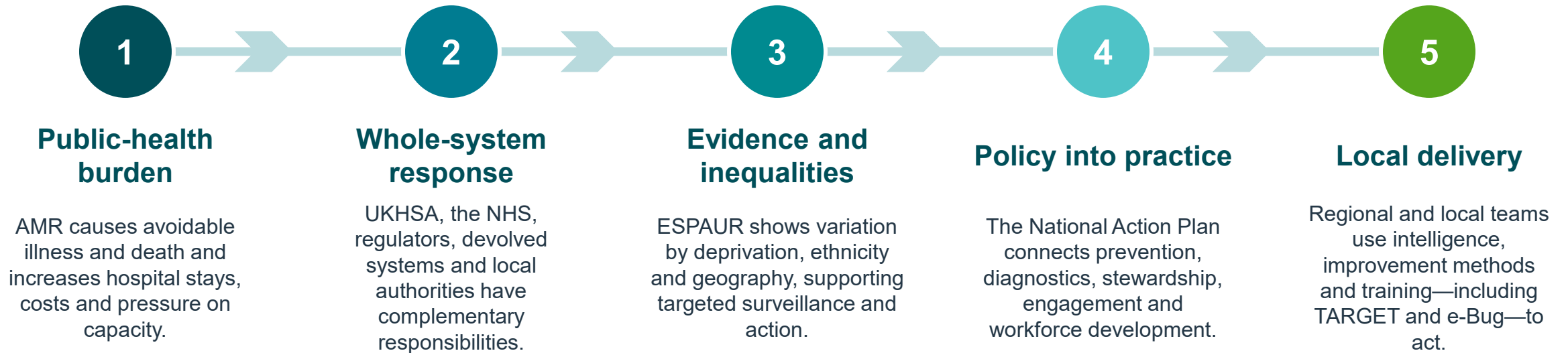
- Report Core20PLUS5 equity metrics on respiratory infection outcomes
- Engage NHS RHO-NICE de-biasing programme: NICE reviewing guidelines in 5 areas to remove embedded bias — align local pathways now
- Commission Equality Impact Assessments on infection pathways

Health inequalities in infection are avoidable, pervasive — and preventable.

AMR is a patient, public-health and system challenge

Effective response depends on surveillance, stewardship, equity and coordinated action at every level

The presentation connects the scale of AMR with the health-system capabilities needed to prevent, detect and respond.



AMR is a whole-system, population-health challenge requiring equitable, evidence-led action.

Signpost to resources

- Antibiotic Guardian *Antibiotic Guardian: pledge to be an Antibiotic Guardian*. Available at: <https://antibioticguardian.com/> (Accessed: 28 August 2026). [Slides 22–28]
- Antibiotic Guardian *Peer-reviewed publications for the Antibiotic Guardian campaign*. Available at: <https://antibioticguardian.com/evaluations/> (Accessed: 28 August 2026). [Slides 22–28]
- Antibiotic Guardian *Shared learning*. Available at: <https://antibioticguardian.com/shared-learning/> (Accessed: 28 August 2026). [Slides 22–28]
- Ashiru-Oredope, D., DeBrun, C., Duxbury Barber, J., Husson, F., Gerver, S., Inada-Kim, M., Brown, C.S. and Hope, R. (2024) *Risk factors associated with disparities in antibiotic-resistant bloodstream infections among socioeconomically disadvantaged groups in high-income countries*. PROSPERO, CRD42024601049. Available at: <https://www.crd.york.ac.uk/PROSPERO/view/CRD42024601049> (Accessed: 28 August 2026). [Slide 47]
- Department of Health and Social Care (2022) *Health and Social Care Act 2008: code of practice on the prevention and control of infections and related guidance*. Updated 13 December 2022. Available at: <https://www.gov.uk/government/publications/the-health-and-social-care-act-2008-code-of-practice-on-the-prevention-and-control-of-infections-and-related-guidance> (Accessed: 28 August 2026). [Slide 19]
- Department of Health and Social Care, Scottish Government, Welsh Government, Department for Environment, Food & Rural Affairs, Department of Agriculture, Environment and Rural Affairs (Northern Ireland) and Department of Health (Northern Ireland) (2024) *UK 5-year action plan for antimicrobial resistance 2024 to 2029: confronting antimicrobial resistance 2024 to 2029*. Available at: <https://www.gov.uk/government/publications/uk-5-year-action-plan-for-antimicrobial-resistance-2024-to-2029> (Accessed: 28 August 2026). [Slide 20]
- Experimental Medicine Division, University of Oxford (n.d.) *NIHR Health Protection Research Unit in Healthcare Associated Infections and Antimicrobial Resistance*. Available at: <https://www.expmmednm.ox.ac.uk/modernising-medical-microbiology/projects/hpru> (Accessed: 28 August 2026). [Slide 47]
- GOV.UK *Policy papers and consultations: antimicrobial resistance*. Available at: <https://www.gov.uk/search/policy-papers-and-consultations?parent=%2Fhealth-and-social-care%2Fantimicrobial-resistance&topic=645d4bd6-84a2-49e0-bc38-f0d5459f583e> (Accessed: 28 August 2026).
- NHS England *Core20PLUS5 (adults): an approach to reducing healthcare inequalities*. Available at: <https://www.england.nhs.uk/about/equality/equality-hub/national-healthcare-inequalities-improvement-programme/core20plus5/> (Accessed: 28 August 2026). [Slide 41]
- UK Health Security Agency (2025) *English surveillance programme for antimicrobial utilisation and resistance (ESPAUR) 2024 to 2025 report*. Updated 13 May 2026. Available at: <https://www.gov.uk/government/publications/english-surveillance-programme-for-antimicrobial-utilisation-and-resistance-espaur-2024-to-2025-report> (Accessed: 28 August 2026). [Slides 15–17]
- UK Health Security Agency (2026) *Addressing health inequalities in infection and antimicrobial resistant infections: a UK-wide collaborative toolkit*. Available at: <https://www.gov.uk/guidance/toolkit-for-addressing-health-inequalities-in-antimicrobial-resistance> (Accessed: 28 August 2026). [Slide 46]
- UK Health Security Agency (n.d.) *e-Bug: infection prevention and antimicrobial resistance education programme*. Available at: <https://www.e-bug.eu/> [Slides 36]
- UK Health Security Agency and Royal College of General Practitioners (n.d.) *TARGET antibiotics toolkit hub*. Available at: <https://www.rcgp.org.uk/targetantibiotics> [Slides 36]
- van Staa, T.P. *et al.* (2024) 'Sepsis and case fatality rates and associations with deprivation, ethnicity, and clinical characteristics: population-based case-control study with linked primary care and hospital data in England', *Infection*, 52(4), pp. 1469–1479. doi: 10.1007/s15010-024-02235-8. Available at: <https://pubmed.ncbi.nlm.nih.gov/38627354/> (Accessed: 28 August 2026). [Slide 42]
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