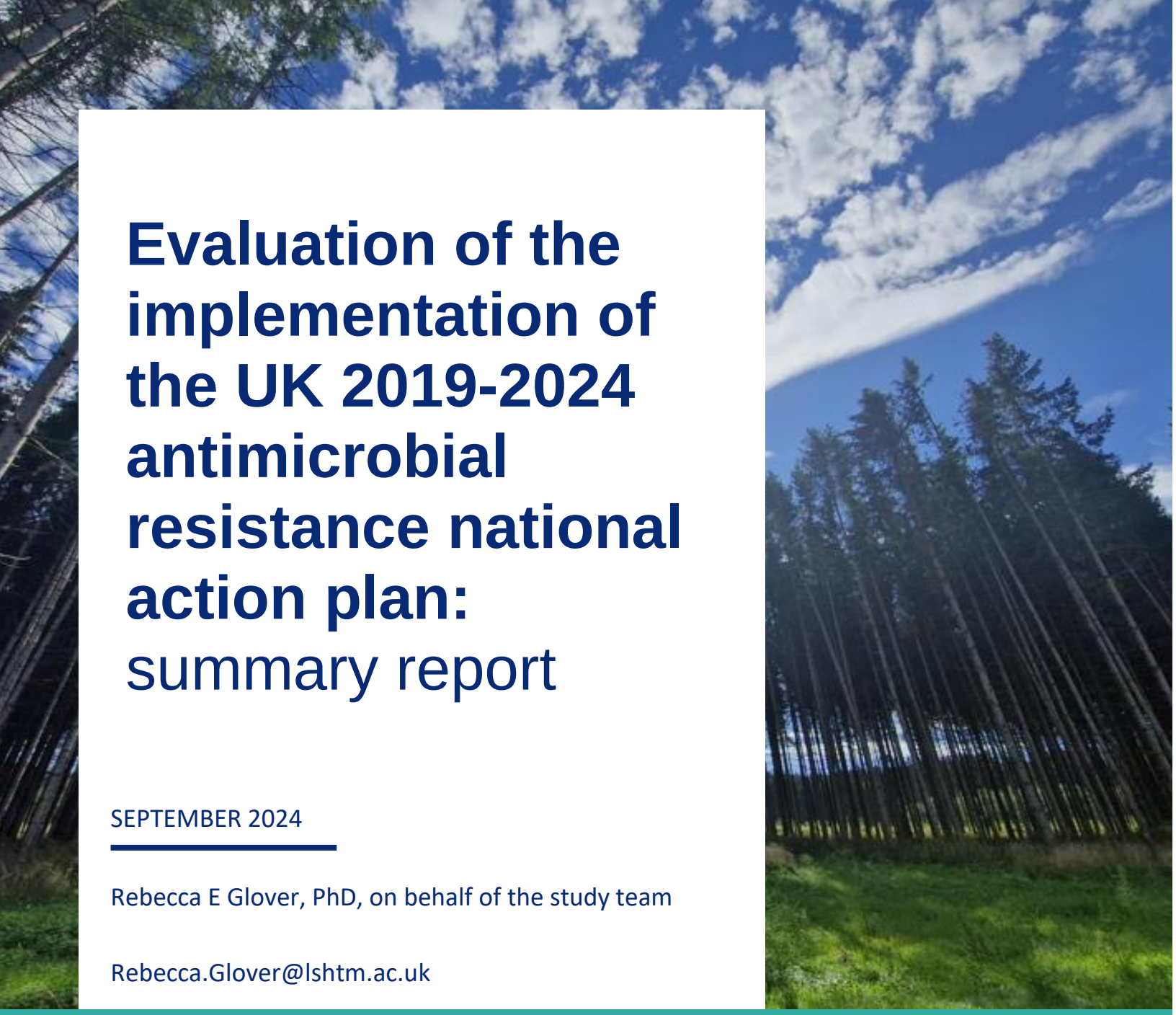

Evaluation of the implementation of the UK 2019-2024 antimicrobial resistance national action plan: summary report

SEPTEMBER 2024

Rebecca E Glover, PhD, on behalf of the study team

Rebecca.Glover@lshtm.ac.uk

PIRU POLICY INNOVATION AND EVALUATION RESEARCH UNIT

FUNDED BY NIHR | National Institute for Health and Care Research

Funding acknowledgment

This report was funded by the NIHR Policy Research Programme through its core support to the Policy Innovation and Evaluation Research Unit (Project No: PR-PRU-1217-20602). The views expressed are those of the author(s) and are not necessarily those of the NIHR or the Department of Health and Social Care.

Acknowledgments

Extended thanks to the study team, based across the UK Centre for Ecology and Hydrology (UKCEH), the Royal Veterinary College (RVC), and London School of Hygiene & Tropical Medicine (LSHTM) for contributions to this and other reports and outputs:

Agata Pacho
Mustafa Al-Haboubi
Houda Bennani
Barbara Haesler
Becky Knowles
Nicholas Mays
Andrew Singer
Isobel Stanton
Holly Tipper
Emily Warren

Executive summary

In 2019, the Department of Health and Social Care (DHSC) released the UK Antimicrobial Resistance (AMR) National Action Plan (NAP) (1). The NAP outlines ambitions and actions over a five-year period, and supports the UK's 20-year vision for AMR (2) in line with World Health Organization (WHO) guidance on national antimicrobial policies and follows the previous "UK Five-Year Antimicrobial Resistance Strategy, 2013-2018" (3). The NAP adopts a One Health approach by including commitments to improve animal health and food safety and to increase the understanding of AMR in the environment. The Policy Innovation and Evaluation Research Unit (PIRU) was commissioned to evaluate the 2019-24 AMR NAP between April 2022 and December 2023. In this report, we summarise our evaluation of the implementation of the NAP's commitments to lower the burden of human infection, optimal use of antimicrobials in human health care, and development of, and access to diagnostics. The main recommendations are summarised in Table 1.

Table 1: PIRU's 'top six' priority areas for AMR policy reform

Priority	Recommendation
1	Focusing on 5-10 highest priority AMR goals using a mixture of feasibility, impact and future-proofing shortlisting criteria to reenergise the AMR policy landscape
2	Stricter regulation of the water industry
3	Systems-focused social science (e.g. informed by complexity science, public health, commercial determinants of health) to better understand AMR policy bottlenecks
4	Paying attention to the links between dairy and beef sub-sectors when implementing measures in the beef sub-sector (to protect young animals' welfare)
5	Forming a diagnostics 'pathway to intervention' linked to (a) prior central evaluation, (b) a central pot of funding to which ICBs could apply to support business cases, and (c) stricter conflict of interest (CoI) regulation
6	Strengthening CoI regulations

Contents

List of abbreviations

A&E Accident and Emergency
AMR Antimicrobial Resistance
AMS Antimicrobial Stewardship
AMU Antimicrobial Use
APRHAI Antimicrobial Prescribing, Resistance and Healthcare Associated Infection
BC British Columbia
CDC Centre for Disease Control
CoI Conflict of Interest
CP community pharmacy
CPOs Carbapenemase-producing organisms
CRE carbapenem-resistant Enterobacteriaceae
CRP C-reactive protein
DCGP Dutch College of General Practitioners
DHSC Department of Health and Social Care
GAS Group A Streptococcus
GP general practitioner
ICB Integrated Care Boards
IPPR Institute for Public Policy Research
LSHTM London School of Hygiene & Tropical Medicine
MALDI-TOF Matrix-Assisted Laser Desorption Ionisation-Time of Flight
MIC minimum inhibitory concentrations
MRSA methicillin-resistant *Staphylococcus aureus*
NAP National Action Plan
NHS National Health Service
NIHR National Institute for Health Research
RDT Rapid Diagnostic Test
RSV respiratory syncytial virus
R&D Research and Development
PF Pharmacy First
PIRU Policy Innovation and Evaluation Research Unit (PIRU)
UKHSA UK Health Security Agency
UTIs urinary tract infections (UTIs)

Introduction

In 2019, the Department of Health and Social Care (DHSC) released the UK Antimicrobial Resistance (AMR) National Action Plan (NAP) (1). The NAP outlines ambitions and actions over a five-year period, and supports the UK's 20-year vision for AMR (2) in line with World Health Organization (WHO) guidance on national antimicrobial policies and follows the previous "UK Five-Year Antimicrobial Resistance Strategy, 2013-2018" (3). The NAP adopts a One Health approach by including commitments to improve animal health and food safety and to increase the understanding of AMR in the environment. Here, we summarise the evaluation's work packages evaluating implementation against the current NAP's commitments to lower the burden of human infection, optimal use of antimicrobials in human health care, and development of, and access to diagnostics.

PIRU was previously commissioned by the DHSC to undertake an evaluation of implementation of the AMR Strategy 2013-2018, and evidence underpinning key mechanisms of change. The Department of Health and Social Care (DHSC) then commissioned the Policy Innovation and Evaluation Research Unit (PIRU) to evaluate the implementation of the UK Antimicrobial Resistance National Action Plan (NAP) and contribute to the development of the successor NAP published in May 2024. The evaluation started in April 2022 and completed in December 2023. This document summarises key findings, and highlights where interested readers can find additional information on each element. Each report, and publications arising, can be found at the PIRU website (see www.piru.ac.uk).

Rationale

Antimicrobial resistance

Antimicrobial resistance (AMR) occurs when microorganisms have evolved to no longer respond to the drugs that have previously worked against them. The emergence of resistance in bacteria is a natural phenomenon that has accelerated in response to the use of antibiotics in agriculture and medicine and their release into the environment, including through municipal and industrial wastewater. AMR is a global threat;

microorganisms with resistance genes can spread through the movement of people, animals, food, soil, air, and water. In addition, some resistance genes can be directly transferred between microorganisms.

Policy context

In 2019 the UK Government, its agencies and the Devolved Administrations in Scotland, Wales and Northern Ireland published "Tackling Antimicrobial Resistance 2019-2024, The UK's five-year national action plan" (NAP) (1). The NAP was published alongside the UK 20-year vision for AMR (2) and follows the previous "UK Five-Year Antimicrobial Resistance Strategy, 2013-2018" (3). The NAP built on the policy set out in the previous Strategy, with a One Health approach adopted in both policy documents. While both the Strategy and NAP contain actions intended to improve infection prevention and control, and prescribing of antibiotics, in animals and humans, the NAP had an expanded scope, including food safety and specific actions aimed at increasing the understanding of AMR in the environment (for example, through support of a river catchment research programme). The NAP focussed on reducing the need for, and unintentional exposure to, antimicrobials (antivirals, antibacterials, antifungals, antiprotozoals, anthelmintics); optimising use of antimicrobials; and investing in innovation, supply and access to antimicrobials. The NAP was intended to be delivered through a range of defined levers (e.g., capacity building, financial incentives) and enablers (e.g., coalition building, political commitment). The NAP set out targets to:

- Halve healthcare associated Gram-negative blood stream infections
- Reduce the number of specific drug-resistant infections in people by 10% by 2025
- Reduce antimicrobial use in humans by 15% by 2024
- Reduce antibiotic use in food-producing animals by 25% between 2016 and 2020 and define new objectives by 2021 for 2025
- Be able to report on the percentage of prescriptions for humans supported by a diagnostic test or decision support tool by 2024

While the NAP pre-dates the COVID-19 pandemic, effective implementation of AMR policy is now even more important. As the research community learns more about the pandemic, the potential impact of COVID-19 on the emergence, transmission and

burden of AMR is becoming clearer. The interface between AMR and the response to COVID-19 is complicated, and includes changes within health care settings including altered prescribing behaviour, and infection prevention and control processes; wider impacts on human health systems (for example, initiatives to increase vaccination rates for other infections such as seasonal flu, and disruption to health services and drug supply chains); changes in the way people come together, move around their communities and access health services; and the wider impacts of the policy response to COVID-19 (for example, resulting in impacts on income and access to education and childcare, and potential impacts on inequalities).(4,5) Each of these changes may have an impact on AMR, with some potentially beneficial (for example, increased handwashing) and others detrimental (for example, increase in use of broad-spectrum antibiotics, and increased rates of healthcare associated infections).(6) There is now a new NAP, '**Confronting antimicrobial resistance 2024 to 2029'**, which has been released to supersede the evaluated NAP, and which references our evaluation, which is accessible here: https://www.gov.uk/government/publications/uk-5-year-action-plan-for-antimicrobial-resistance-2024-to-2029/confronting-antimicrobial-resistance-2024-to-2029.

NAP implementation evaluation

PIRU began evaluation of the implementation of the NAP in April 2022, to contribute to the development and implementation of future AMR policy and adjustment of current implementation plans. The aim of the evaluation was to identify the strengths and weaknesses of the way in which central, regional and local public and private sector agencies had pursued achievement of the NAP targets, and make recommendations for adjustments to implementation of the NAP and development of future Plans. As it was not possible, or necessarily appropriate, to evaluate every aspect of the NAP or all the commitments relevant to particular targets. Instead, the research focused on aspects of the NAP chosen for their evaluability and where evaluation would most likely assist with identifying opportunities for improvement of implementation of AMR policy. Findings of the implementation evaluation are reported in the context of reported progress against the targets set out in the NAP. The evaluation had five elements:

1. Area and sectoral case studies exploring how the NAP is implemented nationally and locally, including the interplay between the two levels of implementation in animal and human health in the UK, focusing on a number of themes of high salience in the NAP;
2. Exploration of implementation of AMR-related data systems in the UK with a focus on progress towards an integrated surveillance system to support adoption of a One Health approach;
3. Supporting effective implementation of the use of diagnostic tests in the UK through exploring governance arrangements in the development and use of a group of diagnostic tests;
4. Supporting stewardship of antibiotics through exploration of self-care from a patient perspective, with a focus on management of common infections;
5. Supporting the management of AMR in the environment through international comparisons of approaches to management of sewerage treatment works to meet environmental objectives and challenges to mitigating AMR.

Below, we provide a brief summary of the work in these five elements.

Ethical approval

This study was reviewed and approved by the Health Research Authority (REC Ref: 22/HRA/3073) and the London School of Hygiene and Tropical Medicine Ethics Committee (LSHTM Ethics Ref: 27930).

Element 1: Area and sectoral case studies

Overview of commissioned work

The cornerstone of the evaluation was a series of case studies exploring how the NAP is implemented nationally and locally, including the interplay between the two levels of national and local implementation in animal and human health across England, Scotland, and Wales. The local aspects of the human health case studies were undertaken at the former NHS Clinical Commissioning Group level in England (or equivalent in Wales and Scotland), and the animal health case study focused on a specific livestock sub-sector, namely, beef cattle. The case studies focused on the following topics, chosen to provide strong insight into the implementation of the NAP in the context of the pandemic.

The first theme relates to governance and accountability. Policy implementation of a UK-wide NAP poses questions for governance and accountability since it requires a large number of organisations in different sectors (and different jurisdictions) at different levels in systems to work together over a long period of time. Thus, the first theme explored the effectiveness of the NAP implementation governance and accountability arrangements through each of the local area case studies, and one livestock sector across the UK.

The additional themes were:

- Management of bacterial infections in community pharmacies in pilot schemes in two selected areas in which community pharmacists were able to prescribe antibiotics for common ailments.
- Progress and challenges with implementation of the Farm Vet Champions scheme in beef cattle
- Implementation of actions to improve health and welfare of beef cattle.

The suggested themes were identified in consultation with members of the UK AMR NAP Programme Delivery Board and DHSC/Veterinary Medicines Directorate (VMD) policy officials, and draw on insights gleaned during the previous PIRU evaluation of the former UK AMR Strategy (2013-2018), our understanding of current AMR research, and explicit links to NAP commitments.

Results

Element 1.1 Human Health case studies:

Interviewees spoke mostly about actions taken to optimise the use of antibiotics by strengthening stewardship programmes using evidence-based guidelines and behaviour change interventions to encourage improved antibiotic prescribing. They provided examples of such initiatives, such as audits monitoring levels of antibiotic prescribing, introducing more guidance on antibiotic prescribing and staff training. Interviewees emphasised the importance of building and sustaining antimicrobial stewardship (AMS) initiatives that are tailored to the local contexts, and emphasised the value of accessing and drawing comparison from locally collected data for tailoring strategies appropriate to the contexts in which they worked. This seemed particularly important in more deprived areas where socioeconomic factors were seen as having an impact on the population's health, thus, generating a greater need for antimicrobials.

Interviewees drew attention to the systemic barriers to optimal AMS, such as understaffing, and the need for balancing the local knowledge of local needs with national or global guidelines. This was especially important where local geographic and population socioeconomic characteristics could not be taken into account in national guidelines despite having a direct impact on AMS. It was acknowledged that issues specific to local contexts and felt pressure coming from patients to prescribe antibiotics could be at odds with goals and strategies for optimal AMS set nationally. While interviewees suggested the need for a variety of strategies that could be used by health care professionals in consultation with patients to raise awareness of AMR, they also pointed to the need for consideration of structural barriers, such as cost, labour

market casualisation, relative poverty, and comorbidities that patients may be facing, especially affecting their ability to access health care services, which may shape their expectations to receive certain treatments such as antibiotics.

Other challenges reported in the interviews included presentation and formatting of prescribing data making them inaccessible or unfit for monitoring prescribing, and the lack of inter-operability of platforms to access and share infection and prescribing data. While interviewees acknowledged that some diagnostics, especially point-of-care tests, might potentially improve administering of antimicrobials, they also suggested that the estimated return on investment required to make the business case plus the logistical implementation challenges were still obstacles preventing take-up.

There are many similarities between the findings of the evaluation of the implementation of the UK AMR NAP and PIRU's earlier evaluation of the UK AMR Strategy. Both evaluations identified the need for national policies to sustain local engagement in AMS, and highlighted the persisting nature of challenges local leaders encounter in their efforts to tackle AMR, such as resource limitations for robust stewardship. In addition, the newer analysis highlights obstacles and potential risks to AMR efforts that have emerged more recently, as a result of the impact of COVID-19 on the UK healthcare system and the widening of the range of professionals with the ability to prescribe antibiotics in primary care. For example, the Pharmacy First scheme, which was introduced in February 2024 allows community pharmacies across England to supply prescription-only medicines, including antibiotics, through the use of Patient Group Directions (PGDs) for some common conditions. One of the lasting consequences of the COVID-19 pandemic was an increase in remote patient consultations. Our interviewees saw the growth of such tele-health care as detrimental to AMS initiatives as it often led to more "empirical prescriptions", which was believed to encourage overprescribing. With regards to the Pharmacy First, the interviewees were especially concerned by the implementation of the sore throat PGDs because of the complexities of diagnosis of sore throat and insufficient clarity around the most appropriate clinical pathway.

Based on these findings, we suggest that:

- Policy makers should consider that, while it is important to continue to provide evidence-based guidelines for prescribing, there is also a need for consideration of local variation in terms of how geographic and population socioeconomic characteristics affect the need for antimicrobial prescribing, especially in more deprived areas.
- Policy makers should monitor the impact of tele-health care on AMR and providing frontline staff with more resources on the risk of overprescribing in tele-healthcare.
- With regards to implementing community pharmacist prescribing of antibiotics in the national Pharmacy First scheme, the blanket roll-out of the sore throat PGD should be reconsidered, given its complexity.

Element 1.2 Beef cattle case study:

The animal health case study focused on a specific livestock sub-sector, namely beef cattle. This sub-sector was chosen because of the potential risk it poses due to its size and its output, the scarcity of usage data and the relatively low frequency of veterinary involvement in beef production.

The findings showed that progress has been made in addressing the commitments in the NAP with many initiatives implemented including the Medicine Hub (MH), the Welsh Lamb and Beef Producers (WLBP) AMU calculator, training for veterinarians and farmers and the Animal Health and Welfare Pathway. However, it was not possible to assess the impacts of these initiatives since some were relatively new, with insufficient data available on their effectiveness. Also, there was a specific lack of data on AMR and AMU. The latter gap is likely to be addressed if the MH can fulfil its potential. There is a need to continue improving the availability of AMU data and ensuring that support is provided to address the barriers to the uptake of the MH, including the allocation of necessary funding. Moreover, it is important to collect structured surveillance data on AMR from veterinary pathogens, which would allow identification of the changes in

susceptibility to antimicrobials over time and assessment of the impacts of interventions.

An increase in vaccine uptake was reported, which is seen as a positive change that needs to be sustained by having a sufficient supply of vaccines.

The overlap between the beef and dairy sub-sectors can create challenges in term of disease mitigation and interventions to reduce AMU. The care received during the initial days of the animals' lives can have a big influence on their subsequent susceptibility to diseases. Therefore, measures implemented in the beef sub-sector need to take into account this link.

Initiatives that facilitate engagement between veterinarians and farmers are considered valuable for building relationships and trust. Moreover, the importance of having time to discuss relevant issues was highlighted, as this would allow veterinarians to provide more targeted advice to farmers.

While many of the initiatives were described as valuable and there was an interest in continuing them, there were also concerns about inadequate resourcing and sustainability. Thus, conducting cost-effectiveness evaluations of the initiatives in place to inform resource allocation and ensuring that adequate resources are available will be crucial for effective implementation and impact.

Completed work and forthcoming publications

The final reports for 1.1 and 1.2 were submitted to DHSC in December 2023.

- A publication for Element 1.1. is in preparation (commissioned original research article)
- Element 1.2 is published in *Antibiotics* and can be found here:

Bennani H, Whatford L, Myers J, Mays N, Glover R, Häsler B. Progress and Challenges: Implementation of the UK Antimicrobial Resistance National Action Plan 2019–2024 within the Beef Cattle Sub-Sector. *Antibiotics*. 2024; 13(9):839. https://doi.org/10.3390/antibiotics13090839

Element 2: AMR-related data systems in the UK

Overview of commissioned work

The UK's antimicrobial resistance (AMR) national action plan (NAP) 2019-2024 (and a subsequent addendum in 2022) included a number of commitments to support AMR and antimicrobial use (AMU) surveillance efforts, and a One Health (OH) multidisciplinary approach as part of the overall effort to tackling AMR. We sought to explore the progress that the UK has made in harmonising its AMU and AMR surveillance systems since the launch of the NAP; the needs of users of AMU/AMR data in the UK, and the extent to which these are being met by current systems; and what can be learned from comparable countries that have also adopted the OH approach.

Results

Initiatives to enhance harmonisation and integration in the AMU/ AMR systems in the UK had been implemented since the launch of the NAP, with the Pathogen Surveillance in Agriculture, Food and Environment (PATH-SAFE) pilot programme being the most prominent example. Opportunities for closer integration and harmonisation were identified including the collection of surveillance data from the general healthy population; having cross-sectoral OH commitments in the NAP; investment in the recruitment and retention of bioinformaticians; allocation of dedicated resources for OH surveillance initiatives; improved facilitation of data and information sharing across sectors; and the collection of AMR surveillance data from the environment on an on-going basis using consistent sampling and analysis methods.

Exploration of integrated surveillance systems for AMU/AMR in the three UK countries identified different structures and modalities of integration, depending on local conditions and context. UK policymakers could consider adopting the following across all three countries: the production of regular joint surveillance reports; establishment of a cross-sectoral co-ordinating committee to steer OH surveillance initiatives on an ongoing basis; benchmarking AMU in the animal health sector; and the wider adoption

of a combined top-down and bottom-up approach to the integration of human, animal and environmental surveillance systems.

Completed work and forthcoming publications

Final report was submitted to DHSC in December 2023, with a publication in preparation for submission to an academic journal.

Element 3: Evaluating diagnostic test uptake in the UK

Effective stewardship of rapid diagnostic tests (for bacterial identification, antibiotic susceptibility testing, and/or distinguishing between bacterial and viral infections) has been identified in the NAP as an important aspect of antimicrobial stewardship to optimise antibiotic prescribing. It includes commitments to incentivise research and development of new diagnostics and support rapid uptake of these diagnostics. While diagnostic test stewardship is the aim (the right diagnostic test at the right time to the right patient), too often this gets confused with diagnostic uptake (more diagnostic tests, more of the time, for more patients), which can be costly and not necessarily informative for clinical and patient decision making. Some diagnostics are clinically useful, others are not, and all diagnostics have the capacity to change patient and provider behaviours in unpredictable ways.

Overview of commissioned work

This element focused on the end-to-end pathway (research and development through to use with patients) of selected diagnostic tests, to identify barriers and facilitators to achievement of an optimal diagnostic pathway. This element of the evaluation focused on the following research questions:

- What are the barriers and facilitators to effective diagnostic stewardship in England?
- How have these barriers and facilitators been managed in other countries?
- How could the diagnostic pathway in the UK be optimised?
- What is the impact of COVID-19 on the preferences and possibilities with respect to diagnostic testing?

Results

The study showed that the system of diagnostic tests is vastly more complex than is usually described. This research also demonstrated the tension between the policy direction (which, broadly speaking, encourages the use of more diagnostics within the health care system) and the ongoing commissioning, reimbursement,

scientific/evidence, and use challenges, which have persisted ever since the diagnostics commitments were articulated in the 2013-18 AMR Strategy over a decade ago.

If the policy direction is to encourage diagnostic testing as a way of reducing the inappropriate use of antibiotics, then policymakers should be aware that:

- There is no central diagnostics data source, and no straightforward way of capturing diagnostic usage data across England, let alone across the four UK countries. This is severely hampering cross-NHS knowledge transfer, and represents an important barrier to diagnostic uptake, knowledge sharing, and monitoring and evaluation. Without this critical step, it is impossible to report the percentage of prescriptions that are supported by a diagnostic, or whether similar commitments in future are realistic.
    - This may therefore merit the co-ordination of diagnostic testing from a network of hospital laboratories, providing quality assurance as well as data on use
- In business cases for provision of diagnostics in this area, there is no requirement to declare conflicts of (or competing) interest, and a general lack of transparent governance arrangements. This should be rectified.
- Local-level diagnostic commissioning remains the norm. This provides autonomy to commissioners but can incur risks to the public purse since it remains a distant ambition to have systems in place allowing for the head-to-head comparison of the costs and effectiveness of these diagnostics.
- Any increase of diagnostic use within a local diagnostics commissioning environment will require Integrated Care Boards (ICBs), individual hospital laboratories, GPs, and other health care providers, to negotiate contracts for increasing numbers of diagnostic tests. These negotiations will take place with better-resourced diagnostics and pharmaceutical companies (of the latter, many are buying up small and medium sized companies as well as larger diagnostics companies and running these as fully owned subsidiaries). This negotiation asymmetry could be mitigated in a number of ways:
    - There is a case for greater transparency in pricing of diagnostics: the price of doing business within the NHS could be to allow for a transparent ‘price per test’ register, visible to all NHS bodies looking to commission a

diagnostic test or service, even if such information is not in the public domain.

- Local commissioning autonomy needs to be balanced against national level technical expertise by situating a 'shortlisting' process for diagnostics at the national level; this would ensure that local needs can still be tailored to, but would protect against the entry and use of inferior products.

Because the barriers to entry of diagnostic tests into the NHS are lower than those for drugs, the evidence base for their comparative clinical effectiveness/utility and cost-effectiveness is frequently less robust. This may mean that useful tests fail to demonstrate solid business cases, but also that less useful, even ineffective tests can capitalise on relationships, marketing, and opaque local-level commissioning to embed themselves. This represents a strategic risk to future successful rapid diagnostic test (RDT) commissioning and implementation; we have found that one bad experience with an RDT can make health care professionals unnecessarily sceptical of other RDTs. MHRA should reconsider the position on licensing of diagnostic tests (to include clinical utility as well as safety and quality) or that NICE must review clinical utility and cost-effectiveness of tests deployed at different stages of patient pathways before tests are routinely adopted. **A key takeaway for policymakers and commissioners is that the current system is not well equipped to distinguish those tests that are potentially going to provide value for money versus those that are not.**

Completed work and forthcoming publications

A final report was circulated to DHSC, UKHSA, and NHSE for comment in June 2024 and comments were returned at the end of July. Comments have been addressed, and there are two papers in preparation from the report:

- Glover et al. *C-reactive protein diagnostic uptake in primary care in the context of antimicrobial resistance (AMR) policy: a qualitative study of the UK's AMR National Action Plan and lessons learned from Sweden, the Netherlands, and British Columbia.* In preparation.
- Glover et al. *Exploring drivers and challenges influencing Group A Streptococcus diagnostic test uptake in primary health care in the UK*. In preparation.

Element 4: Self-care from a patient perspective

Self-care spans a continuum of health care that includes health promotion, self-testing, screening and diagnosis for disease prevention, and self-medication. Self-care is important for people managing the discomforts of their or their family's minor illnesses. However, a lack of knowledge or confidence to treat symptoms can obstruct self-care (7). While self-care may increase people's engagement with, and autonomy over, their health, and reduce the demand for professional health care services (8), shifting responsibility to individuals may shift the financial burden of accessing care to the users, and the financial and non-financial barriers to accessing self-care may introduce or worsen inequalities in subsequent access to treatment and outcomes (9).

Overview of commissioned work

This element in the AMR NAP evaluation examined enablers and barriers to self-care of urinary tract infections (UTIs), one of the most common conditions that often results in mainly women seeking professional health care and receiving antibiotic treatment (10,11). It paid particular attention to the differential equity effects on underserved subgroups in the population and examined financial and non-financial consequences of self-care from the patient perspective. (12-17). Specifically, it focused on women from racialised minority groups and women affected by poverty. It sought to identify the extent to which structural inequalities impact self-care capacity and what the potential opportunities and constraints to effective self-care are.

This work package focused on the following aims:

- Understanding how self-care is understood and practised by women in relation to managing UTIs
- Generating knowledge of how structural inequalities impact women's self-care capacity
- Identifying the potential contribution of self-care to meeting NAP targets

The research questions were:

- What are the potential opportunities and constraints to effective self-care?

• What are the financial and non-financial consequences of self-care for different sub-groups of the population? What are the other burdens of self-care (e.g., time, energy, impact on relationships)?
• What is the potential legacy of the COVID-19 epidemic for an understanding of self-care?

Focus groups and in-depth interviews were undertaken with women from racialised minority groups and/or living in a household below £19k.

Results

These women often relied on family members and friends who had knowledge or experience of UTIs to supplement self-care. When recovering, they often needed to take time off work. Most women described their symptoms as distressing on occasions and thus wanted to seek help from healthcare professionals (HCPs) even if they were uncomfortable with discussing their symptoms. They emphasised that obtaining a formal diagnosis and guidance from HCPs were vital to their recovery, and were valued in their own right, irrespective of whether they resulted in an antibiotic prescription. From this perspective, self-care was not necessarily a substitute for professionally delivered health care, especially for women who needed an officially recognised diagnosis. In policy terms, self-care and professional help should be considered in complementary terms.

If the policy direction is to encourage self-care as a way of reducing the inappropriate use of antibiotics but in an equitable way, then:

- Policy to promote self-care should respect the knowledge that women have of their bodies, especially when living with recurrent UTIs, and thus avoid resting on assumptions that women who seek professional help are doing so out of ignorance and/or in search of the 'quick fix' of an antibiotic.
- Policy makers need to take into account the fact that women often obtain informal knowledge and advice that helps them with their self-care strategies for UTIs before seeking professional health services but still see consultations with HCPs as valuable both for navigating the symptoms of UTIs and for identifying the scope for, and limitations of, self-care options.

- Policy makers should be aware that women value consulting professionals for advice and support about their UTIs, irrespective of whether or not they receive an antibiotic prescription, so they should not be indiscriminately deterred from consulting primary care professionals for advice as part of a push to reduce the risk of AMR.
- Policy should bear in mind that access to professional advice is particularly important for women already known to face greater barriers to accessing health services and who have fewer resources for self-care, including for over-the counter (OTC) purchases.
- Policy needs to recognise that a formal UTI diagnosis and a 'fit note' (Statement of Fitness for Work) may be necessary to enable some patients to take time off work without losing pay and thus avoid worsening their financial hardship.

Completed work and forthcoming publications:

The final report was submitted in November 2023, and a paper has been accepted by *Journal of Health Services Research & Policy* pending minor revisions, September 2024.

Element 5: comparisons of approaches to management of sewerage treatment works to meet environmental objectives and challenges to mitigating AMR

Overview of commissioned work

This element focused on how the environmental regulators of the four nations and the water industry within the UK directly or indirectly address the requirements of the UK AMR NAP. The first report from this element aimed to answer two questions: 1) How have the environmental regulators and the wastewater treatment industry responded to the five environmentally focused challenges within the UK AMR NAP; and 2) What are the policies, guidance, procedures, or innovations in wastewater treatment, sludge disposal, and combined sewer overflows that can contribute to lowering the environmental burden of AMR and its by-products since the implementation of the UK AMR NAP?

Results

Antimicrobials contribute to AMR alongside a wider group of AMR-driving chemicals (ARDCs) that are known to select for, or aid in, the dispersal of AMR, such as metals, biocides, pesticides and many other environmental pollutants. High levels of resistant bacteria can be found associated with industry discharges, agriculture, municipal wastewater (wastewater treatment plants, combined sewer outfalls and sewage sludge) and meat, egg, sport animal and dairy production activities (feed, chemotherapy, biosecurity, manure and slurry). Source reduction of ARDCs and antimicrobial-resistant microorganisms is likely to be the most important route towards reducing the burden of AMR in the environment. Reducing ARDC and AMR microorganisms entering the environment from sewage and its by-products can be achieved by: 1. Improving wastewater treatment; 2. Improving the treatment of sewage sludge; and 3. Eliminating the need for combined sewer overflows and storm

overflows which represent a short-circuit in the wastewater treatment pathway for ARDCs and AMR microorganisms. The absence of a national AMR surveillance programme in the environment precludes any detailed longitudinal understanding of AMR in wastewater-impacted systems (e.g., rivers, coast, groundwater and soil). However, academic studies have uniformly demonstrated the capability of wastewater and its by-products (sludge), to have a significant impact on the prevalence and diversity of AMR in the receiving environment.

Completed work and forthcoming publications

A review of UK environmental regulators and wastewater industry activities relating to the UK AMR NAP was produced up-to-date as of end of August 2022 and submitted to DHSC, VMD, and Defra colleagues in April 2023. A second report was submitted in September 2023 which was a qualitative international comparison report focusing on the water and AMR systems internationally, in Canada, the Netherlands, and Sweden. In addition to these:

- One commentary is in preparation
- One qualitative research paper is in preparation

Conclusion

PIRU undertook the evaluation of the 2019-2024 AMR National Action Plan from April 2022 to October 2023, with report writing extending to December 2023. This 18-month evaluation was able, with the help of desk reviews, systems mapping, qualitative interviews with policymakers, professionals, and patients, and focus groups, to point to clear gaps across the implementation within the policy milieu for AMR. Upon completion of our evaluation, we developed a prioritised list of policy recommendations, which we reproduce here.

Table 2: PIRU'S top six policy priorities

Priority	Recommendation
1	Focusing on 5-10 highest priority AMR goals using a mixture of feasibility, impact and future-proofing shortlisting criteria to reenergise the AMR policy landscape
2	Stricter regulation of the water industry
3	More funding systems-focused social science (e.g. informed by complexity science, public health, commercial determinants of health) to better understand why some AMR policies are not leading to big gains
4	Paying attention to the links between dairy and beef sub-sectors when implementing measures in the beef sub-sector (to protect young animals' welfare)
5	Forming a diagnostics 'care cascade', or 'pathway to intervention' – developing a list of approved tests based on formal diagnostic test technical product specification, and linking this to (a) prior central evaluation, (b) a central pot of funding to which ICBs could apply to support business cases, and (c) stricter conflict of interest (CoI) regulation
6	Strengthening diagnostic access, but only with commensurate strengthening of CoI regulation, and evaluation, linked to potential removal of low-value diagnostics to optimise transparency and value for the public purse

Works Cited

1 Department of Health and Social Care. Tackling antimicrobial resistance 2019–2024. The UK's five-year national action plan (2019). https://www.gov.uk/government/publications/uk-5-year-action-plan-for-antimicrobial-resistance-2019-to-2024

2 UK 20-year vision for antimicrobial resistance. London: UK Government; 2019 [cited 2023 Dec 15]. Available from: https://assets.publishing.service.gov.uk/media/5c48896a40f0b616fe901e91/uk-20-year-vision-for-antimicrobial-resistance.pdf

3 UK Government. UK 5 Year Antimicrobial Resistance Strategy 2013 to 2018. 2013. [Accessed December 15, 2023]. Available from: https://assets.publishing.service.gov.uk/media/5a7cc51eed915d68223626ff/20130902_UK_5_year_AMR_strategy.pdf

4 Knight GM, Glover RE, McQuaid CF, Olaru ID, Gallandat K, Leclerc QJ, Fuller NM, Willcocks SJ, Hasan R, van Kleef E, Chandler CI. Antimicrobial resistance and COVID-19: Intersections and implications. Elife. 2021 Feb 16;10:e64139. doi: 10.7554/eLife.64139. PMID: 33588991; PMCID: PMC7886324.

5 Antimicrobial resistance in the age of COVID-19. *Nat Microbiol* 5, 779 (2020).

6 Hsu J. How covid-19 is accelerating the threat of antimicrobial resistance BMJ 2020; 369 :m1983 doi:10.1136/bmj.m1983

7 Gustafsson S, Vikman I, Savenstedt S, Martinsson J. Perceptions of needs related to the practice of self-care for minor illness. *Journal of Clinical Nursing,* 2015: 24, 3255–3265, doi: 10.1111/jocn.12888

8 Panagioti M, Richardson G, Small N, Murray E, Rogers A, Kennedy A, Newman S, Bower P. Self management support interventions to reduce health care utilisation without compromising outcomes: a systematic review and meta-analysis. *BMC Health Serv Res* 2014;14:356. doi:10.1186/1472-6963-14-356 pmid:25164529

9 Remme M, Narasimhan M, Wilson D, Ali M, Vijayasingham L, Ghani F, Allotey P. Self care interventions for sexual and reproductive health and rights: costs, benefits and financing. *BMJ* 2019: 365: I1228. *doi.org/10.1136/bmj.l1228*

10 Thornley T, Kirkdale CL, Beech E, Howard P, Wilson P, Evaluation of a community pharmacy-led test-and-treat service for women with uncomplicated lower urinary tract infection in England, JAC Antimicrob Resist, 2020.

11 Dolk FCK, Pouwels KB, Smith DRM et al. Antibiotics in primary care in England: which antibiotics are prescribed and for which conditions? J Antimicrob Chemother 2018; 73: ii2–10.

12 Covvey JR, Johnson BF, Elliott V, Malcolm W, Mullen AB. An association between socioeconomic deprivation and primary care antibiotic prescribing in Scotland. J Antimicrob Chemother. 2014;69(8):835-841.

13 Cabral C, Horwood J, Hay A, et al. How communication affects prescription decisions in consultations for acute illness in children: a systematic review and metaethnography. BMC Fam Pract. 2014;15(63):63.

14 Evandrou M, Falkingham J, Feng Z, et al. Ethnic inequalities in limiting health and self-reported health in later life revisited. Journal of Epidemiology and Community Health. 2016;70(7):653-62.10.1136/jech-2015-206074

15 Mortality from leading causes of death by ethnic group, England and Wales: 2012 to 2019. Office of National Statistics; 2020.https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/articles/mortalityfromleadingcausesofdeathbyethnicgroupenglandandwales/2012to2019#mortality-from-leading-causes-of-death-2012-to-2019

16 Warner M, Burn S, Stoye G, et al. Socioeconomic deprivation and ethnicity inequalities in disruption to NHS hospital admissions during the COVID-19 pandemic: a national observational study. BMJ Quality & Safety. 2021:bmjqs-2021-013942.10.1136/bmjqs-2021-013942

17 Watkinson RE, Sutton M, Turner AJ. Ethnic inequalities in health-related quality of life among older adults in England: secondary analysis of a national cross-sectional survey. The Lancet Public Health. 2021;6(3):e145-e54

Appendix 1: Agreed evaluation components and map to the 2019-24 AMR NAP

	1. Case studies with thematic studies	2. Implementation of data systems	3. Adoption of rapid diagnostic tests	4. Self-care from a patient perspective	5. Management of sewerage treatment works
Human infection prevention and control	■	■		■	
Clean water and sanitation					
Animal infection prevention and control	■	■			
Environmental contamination					■
Food safety					
Optimise the use of medicines for humans	■	■		■	
Optimise use of medicines in animals and agriculture	■	■			
Laboratory capacity and surveillance - humans		■			
Laboratory capacity and surveillance - animals		■			
Basic research					
Development of new therapeutics					
Access to therapeutics					
Diagnostics development and access			■		
Vaccine development and access					
Quality					