MANCHESTER JOINT STRATEGIC NEEDS ASSESSMENT
ADULTS AND OLDER PEOPLE

CHAPTER: Physical Health

TOPIC: Antimicrobial Resistance (AMR)

1. WHY IS THIS TOPIC IMPORTANT?

Introduction

An antimicrobial is a drug that selectively destroys or inhibits the growth of microorganisms. Sometimes referred to as 'antimicrobial agents', antimicrobial medicines include antibiotics, antiprotozoals, antivirals and antifungal medicines. They have been at the forefront in the battle to reduce infectious diseases for much of the past century. They are primarily used to treat infectious diseases in humans and animals but are also of great value in the prevention of infections when used as prophylaxis.

Antimicrobial Resistance (AMR) is the ability of a micro-organism to grow or survive in the presence of an antimicrobial at a concentration that is usually sufficient to inhibit or kill microorganisms of the same species and that exceeds concentrations achievable in the human / animal / patient. In simple terms, AMR arises when the micro-organisms that cause infection survive exposure to a medicine that would normally kill them or stop their growth, thus increasing the risk of the resistant organism to be passed on to others.

This is a particular concern with antibiotics. Many of the medical advances in recent years, for example, organ transplantation and cancer chemotherapy need antibiotics to prevent and treat the bacterial infections that can be caused by the treatment. Without effective antibiotics, even minor surgery and routine operations could become high risk procedures if serious infections can't be treated.

Resistance is a natural biological phenomenon but is increased and accelerated by various factors such as misuse of medicines, poor infection control practices and global trade and travel. While over time some microorganisms can develop resistance to antimicrobials naturally, the majority of resistance develops due to human practices.

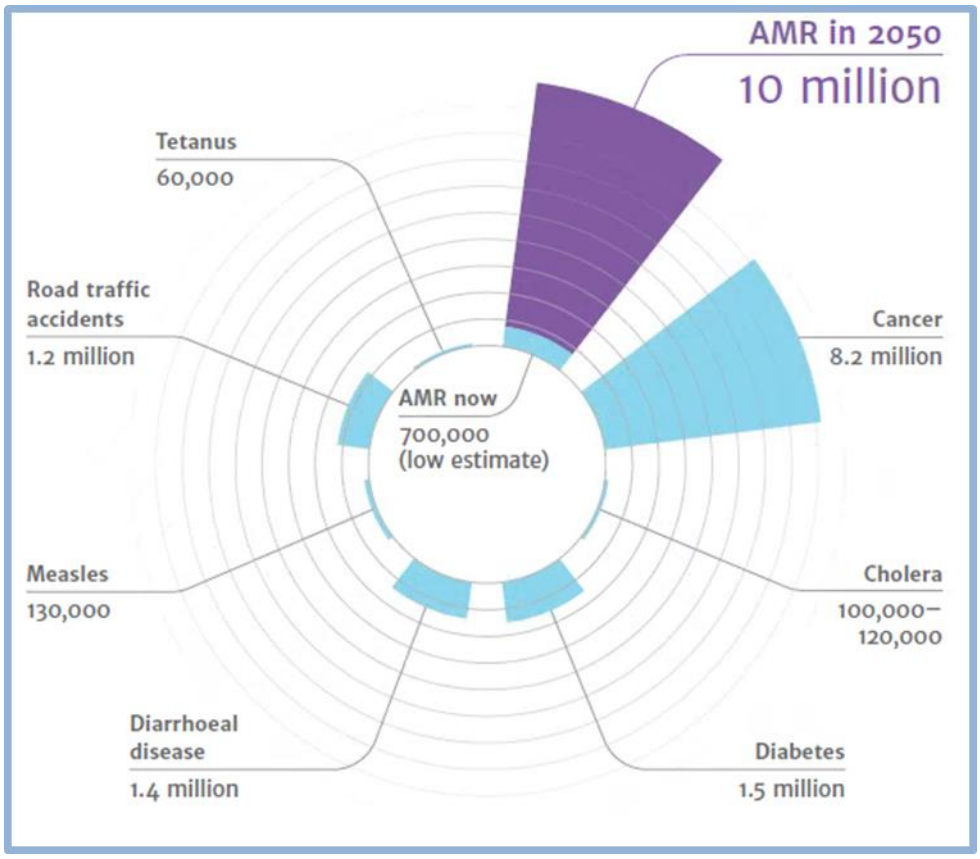
Four key causes of antimicrobial resistance have been considered by the House of Commons Health and Social Care Committee:

1. Inappropriate use of antimicrobials in health care
2. Poor infection control
3. Inappropriate use of antimicrobials in agriculture
4. Spread of resistance via global travel

The World Health Organization (WHO) has described AMR as one of the biggest threats to global health, food security and international development. It is estimated that currently 700,000 people die of resistant infections every year. If AMR is not tackled, it is estimated that antimicrobial resistant infections could kill 10 million

people per year globally by 2050 - more than cancer and diabetes combined (see Figure 1).

Figure 1: Number of deaths attributable to antimicrobial resistance by 2050



Source: Review on Antimicrobial Resistance (The O'Neill Review).

As well as serious impacts on health, AMR may also pose a threat to economic wellbeing. The World Bank has issued a report suggesting that if current trends continue, by 2050 AMR could cost at least $300 billion in health care costs globally per year. If further negative impacts on GDP and world trade are also accounted for, the cumulative total economic loss of AMR by 2050 could be $100 trillion

Antimicrobial Resistance in the UK

Resistance to antibiotics remains a key risk on the UK Government's risk register. For the NHS this resistance can pose serious long-term implications for complex surgery, cancer treatment and organ transplantation as well as potential harm to patients up to, and including, mortality. This is in the context of a virtually non-existent pipeline of new antibiotics. Resistance is directly related to the volume of antibiotic use. Therefore, the aim is to minimise the inappropriate use of antibiotics.

In recognition of this risk, the UK government has published a 5-year national action plan for the period 2019-2024 which sets out the steps that are needed to make sure that current antibiotics stay effective by reducing the number of resistant infections and supporting clinicians to prescribe appropriately.

The English Surveillance Programme for Antimicrobial Utilisation and Resistance (ESPAUR), was initially established in 2013 to support Public Health England (PHE) in the delivery of the UK Five Year Antimicrobial Resistance Strategy 2013 to 2018. At present, 98% of clinical laboratories in the UK participate in this programme. The fifth annual report of the ESPAUR was published in October 2018.

The data show that the proportions of bacterial species causing blood stream infections that are resistant to key antibiotics have remained stable over the last 5 years. This is in contrast to many other countries globally and most likely reflects good antimicrobial stewardship and rare use of cephalosporins and quinolones in the community settings which have reduced levels of antibiotic prescribing in England and, in turn, have reduced selective pressure for spread of resistant strains. However, as the incidence of blood stream infections has continued to increase, the burden of resistance as measured in terms of total numbers of antibiotic-resistant blood stream infections has increased by 35% from 2013 to 2017, driven largely by the year-on-year increased incidence of blood stream infection. This highlights the importance of initiatives focussing on infection prevention and control.

However, there are a number of caveats associated with the national data, notably the fact that that national surveillance of AMR involves the collation of routinely generated antibiotic susceptibility test results from hospital microbiology laboratories. Variation in laboratory testing policies between UK labs will therefore affect the national data.

Gram Negative Bacteria

Gram-negative bacteria include Escherichia coli (E. coli), Klebsiella species and Pseudomonas species. They pose a particular and growing public health concern because of their propensity to cause bloodstream infections and the limited treatment options available for infections caused by these bacteria, especially those that are resistant to carbapenem antibiotics, which are the last-line drugs used to treat those infections. Urinary tract infection (UTI) is the most important primary focus of E. coli, Klebsiella species and Pseudomonas aeruginosa bacteraemia.

Mandatory surveillance of Escherichia coli (E.coli) has indicated a rise in the counts and rates of E. coli bacteraemia. The total number of cases reported by NHS Trusts in England in 2017/18 has increased by 1.1% between 2016/17 and 2017/18 and by 27.1% since 2012/13. It is estimated that Gram Negative Bloodstream Infections (GNBSI) contributed to 5,500 NHS patient deaths in 2015. The UK 5-year national action plan for tackling antimicrobial resistance highlights a rise in the incidence of these infections as one of the biggest drivers of antimicrobial resistance in the UK.

As part of the drive to reduce AMR, there has been a national ambition since 2017 to reduce the numbers of healthcare associated GNBSI. Overall, rates of Meticillin-Resistant Staphylococcus aureus (MRSA) bacteraemia and C. difficile infection in England have continued to fall year on year. In contrast, rates of E. coli and Meticillin-Sensitive Staphylococcus aureus (MSSA) have increased, with the most prominent rises seen in the community.

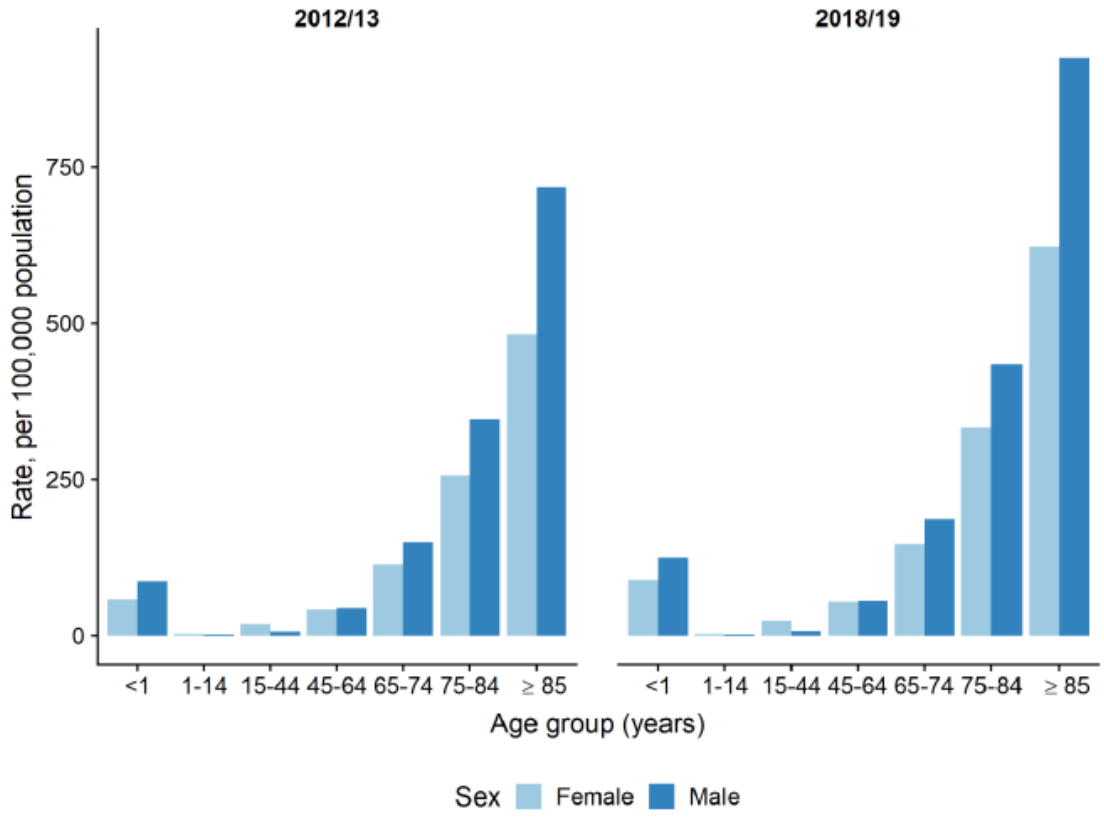
Over time, infections that originated in the community (community-onset infections) have accounted for an increasing proportion of cases, although a large number of

cases still originate in hospital (hospital-onset infections). While many of the infections were community-onset, it is estimated that a large proportion (up to 50% in the case of E. coli) have had recent healthcare interactions.

The most recent annual epidemiological commentary on gram-negative bacteraemia, MRSA bacteraemia, MSSA bacteraemia and C. difficile infections (covering the period April 2018 to March 2019) shows how rates of infection vary by age and sex.

The chart below compares the age and sex structure of E. coli bacteraemia cases in England between 2012/13 and 2018/19. For both years, E. coli bacteraemia rates were highest among patients aged 85 years of age or over. In 2018/19, this age group accounted for 22.9% of all E. coli bacteraemia's.

Figure 2: Age and sex structure of E. coli rates per 100,000 population, England



In general, the rates of E. coli bacteraemia are greater among males than females, and particularly so among older age groups, the exception being in young adulthood (15-44) where the rate of E. coli bacteraemia is considerably higher among females than males. These patterns are generally found across all the pathogens.

The levels of AMR for all three bacteria vary in different parts of England. For example, in the case of E. coli, London consistently showed higher resistance to ciprofloxacin, gentamicin and third-generation cephalosporins throughout 2012 to 2016 compared with other NHS regions.

Carbapenemase-producing enterobacteriaceae (CPE)

Health care acquired infections (HCAIs) associated with multi-drug resistant (MDR) Gram-negative species are of utmost importance due to the difficulties in treatment associated with the limited number of effective antibiotics.

Carbapenems are a class of antibiotic used to treat severe infections. Some bacterial strains have developed enzymes (carbapenemases) that destroy carbapenem antibiotics, thereby causing resistance. There is a national aim to eliminate CPE resistance. However, rates of carbapenemase-producing enterobacteriaceae (CPE) are increasing within the UK and there are increasing problems with resistance amongst enterobacteriaeceae types of bacteria (most commonly E, coli, Salmonella and Klebsiella). Nationally, there were just 3 reported cases of CPE in 2015. In comparison, there were 332 reported cases in 2010 and 1,872 in 2015.

Referrals of Gram-negative bacteria to PHE for carbapenemase testing have been increasing and in 2017, approximately 3,000 isolates were confirmed as positive for at least 1 carbapenemase. The majority of isolates were from sites suggesting colonisation rather than clinical infection, with the proportion of isolates from bloodstream infections falling from 11.3% (in 2014) to 7.2% (2017). Although more than 98% of E. coli and K. pneumoniae detected from blood remain phenotypically susceptible to carbapenems, there has been rapid increases in carbapenem resistance reported from a number of other countries.

Nationally, screening for CPE has increased and there are a whole host of infection control measures that are being taken to ensure a reduction in cross colonisation and to ensure the most vulnerable of patients are safe. Patients with CPE are isolated as soon as they arrive in the front door of hospitals. Unfortunately unlike other colonised infections there is no recognised eradication therapy.

Gonorrhoea

In 2017, 44,676 diagnoses of gonorrhoea were reported - a 22% increase relative to the previous year. Resistance in Neisseria gonorrhoeae, particularly to ceftriaxone and azithromycin which are used in combination as recommended first-line therapy, is monitored through the Gonococcal Resistance to Antimicrobials Surveillance Programme (GRASP). Of the 1,268 gonococcal isolates collected through the sentinel surveillance system in 2017, no isolates were phenotypically resistant to ceftriaxone although the prevalence of azithromycin resistance was 9.2%. In 2018, the UK saw its first case of extensively-drug resistant gonorrhoea, with 2 further (unrelated) cases reported in England in 2019.

Tuberculosis

Multidrug-resistant Tuberculosis (MDR-TB) occurs when the body develops a resistance to the two most commonly used drugs in the current four-drug (or first-line) treatment regimen, isoniazid and rifampicin. Extensively drug-resistant tuberculosis (XDR-TB) is a strain of tuberculosis that is resistant to all four commonly used anti-TB drugs. Drug-resistant TB develops when the usual TB drug regimen is improperly administered or when people with TB stop taking their medicines before the disease has been fully eradicated from their body. Once a drug-resistant strain has developed, it can be transmitted directly to others.

There are over half a million cases of drug-resistant TB each year and its spread is undermining efforts to control the global TB epidemic. The World Health Organisation (WHO) reports that there were 600,000 new cases with resistance to rifampicin (the most effective first-line drug) in 2016, of which 490,000 had multidrug-resistant TB. In 2015, a report from the All Party Parliamentary Group on Global Tuberculosis (APPG TB) stated that multidrug-resistant tuberculosis could kill 75 million people over the next 35 years and could cost the global economy a cumulative $16.7 trillion - the equivalent of the European Union's annual output.

Nationally, 5,102 people were notified with TB in 2017, 71% of whom were born outside the UK. Resistance predictions from whole genome sequencing for at least isoniazid and rifampicin were available for 98.8% of notified cases of culture-confirmed TB. Among these, 8.5% had resistance to at least 1 first-line antibiotic, of which 5.7% had resistance to isoniazid without multi-drug resistant TB (MDR-TB) and there were 55 cases of TB where the infecting strain had any resistance to rifampicin, including those with MDR-TB.

Fungal Infections

Although most focus is on bacteria developing resistance to antibiotics, there are also concerns about other pathogens such as fungi becoming resistant to antifungals. Fungal infections primarily occur in people with weakened immune systems, such as those with HIV, transplant patients or people with cancer.

An example of the problems antifungal resistance is causing, is seen in Candida auris. This fungus was first seen in Japan in 2009, and is resistant to all commonly used antifungal drugs such as amphotericin B. In 2015-17 Candida auris infected over 200 people in the UK, most of whom were patients in intensive care units. In response to this, Public Health England (PHE) has issued guidance regarding patients with Candida auris and has set up a new study to assess what proportion of people admitted to intensive care units are already colonised with the fungus. There are no sustained outbreaks of Candida auris currently occurring in English hospitals, despite frequent introductions from abroad, as largescale outbreaks continue to be documented in several continents.

Antibiotic consumption

In England, prescriptions for antibiotics are written by medical, dental and nursing professionals in general practice, dental practice, hospitals and other community services (e.g. out of hours services and walk in centres). Other professional groups, such as pharmacists, can also prescribe antibiotics. Continuous measurement, with the ability to identify the prescriber location (e.g. hospital, general practice, dental), is essential for tracking antibiotic use over time and determining the effectiveness of antimicrobial stewardship (AMS) programmes in different populations. It also determines particular antibiotics whose usage is rapidly rising, to help target resources and interventions to curb these increases.

There are many good reasons why antibiotics are prescribed in general practice. Many of these prescriptions are appropriate and in line with national guidelines and best practice. However, in some cases antibiotics may be prescribed unnecessarily which can then affect patient safety and antimicrobial resistance. Data from GP practices across England and Wales from 2000-2015 showed substantial increases

in the rate of antibiotic prescribing. However, prescriptions issued rarely reflect the risk of a patient being hospitalised within 30 days of their GP visit. Patients at high risk are not always prescribed antibiotics, while patients at low risk are frequently prescribed. Further research is needed to understand this in more detail.

Antibiotic use is measured as a defined daily dose (DDD) per 1,000 people in the population. In 2016, the total consumption of antibiotics in primary and secondary care was 21.4 DDD per 1,000 population per day. There was a statistically significant ($p<0.05$) decline of 5.1% over the last five years, with the main decline occurring between 2014 and 2015 and a further 0.9% reduction from 2015 to 2016. Total antibiotic consumption in England fell by 6.1% between 2014 and 2017; this was the inverse of what occurred between 2010 and 2013 when a 6% increase was observed. In 2017, the most commonly used antibiotics in England continued to be penicillins (44.6%), tetracyclines (22.2%) and macrolides (14.7%).

The majority of antibiotics in England were prescribed in the GP setting (74%), followed by hospital inpatients (11%), hospital outpatients (6%), patients seen in dental practice (5%) and patients in other community settings (3%). This reflects the patient use of NHS services, where primary care services see 90% of NHS contacts daily. Different trends were seen for each of these settings. In a GP setting, consumption of antibiotics decreased from 17.3 to 15.9 DDD per 1,000 population per day (-8.1%) from 2012 to 2016. However, there was an increase in total secondary care prescribing from 3.58 to 3.81 DDD per 1,000 population per day (6.5%) between 2012 and 2016.

Primary care settings accounted for 81% of all antibiotics prescribed in 2017. However, the number of antibiotic prescriptions dispensed in primary care declined from 754 per 1,000 patients in 2013 to 654 per 1,000 patients in 2017, equating to a drop of 13.2% in 5 years. Between 2014/15 and 2017/18, there were more than 3.7 million fewer antibiotic prescriptions dispensed from community pharmacies. This is a positive development.

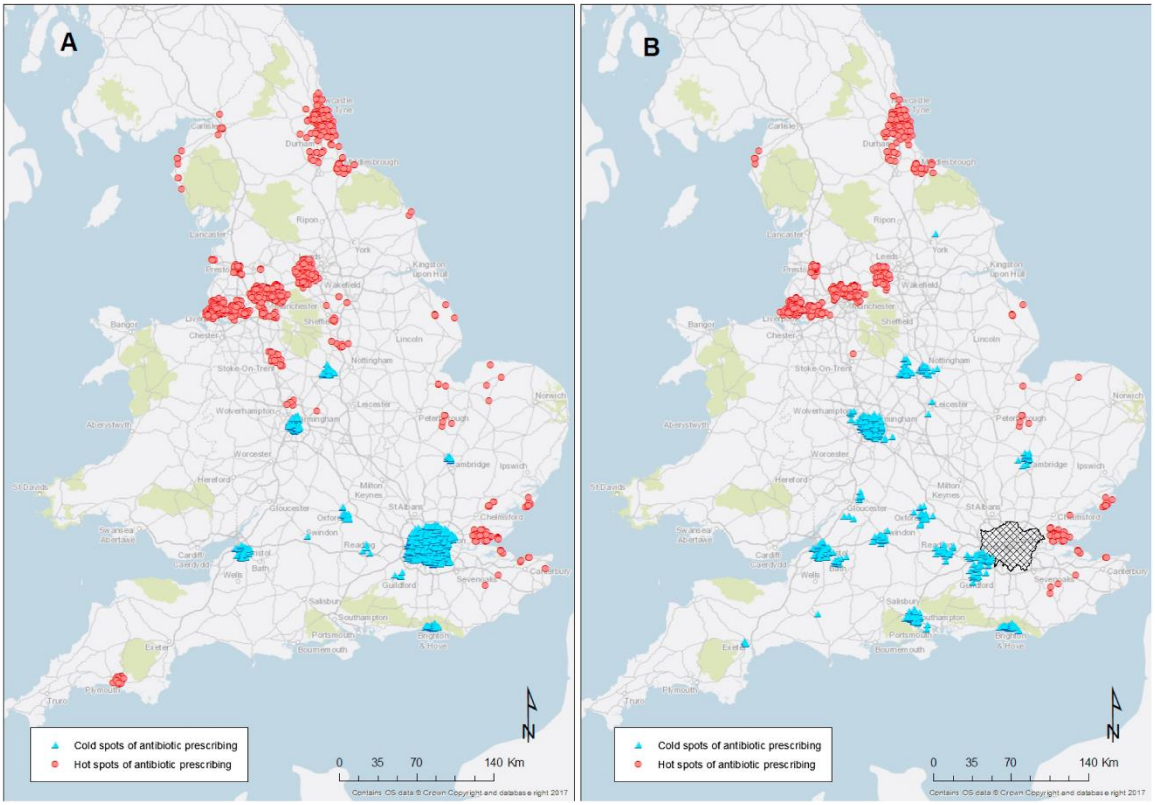
Overall antibiotic consumption in secondary care in England increased by 7.7% between 2013 and 2017. Prescribing for hospital inpatients increased by only 2% but increased by 21% in hospital outpatient settings over the five-year period. This is an improvement compared to the data for 2010 to 2013 which showed that prescribing to hospital inpatients increased by 11.9%. This potentially reflects improved focus on antibiotic stewardship for hospital inpatients. Early data from PHE modelling work on inappropriate antibiotic use in secondary care shows that 17.1% of antibiotic therapy days were estimated to be unnecessary.

The increased level of antibiotic consumption in hospital inpatients also reflects a shortage in the supply of a key broad-spectrum antibiotic, piperacillin/tazobactam. The need to use 2 or more alternative antibiotics to give the same degree of antibacterial coverage resulted in an additional 2.2 million DDDs being dispensed. In 2017/18, 23%, 75% and 45% of 152 NHS Acute Hospital Trusts met their objectives to reduce total antibiotic, piperacillin / tazobactam and carbapenem consumption as measured through the national Commissioning for Quality and Innovation (CQUIN) for Anti-Microbial Resistance (AMR).

There is some variation in the levels of antibiotic prescribing between NHS Area Teams in England. People living in the Merseyside use 30% more antibiotics than those living in Lancashire. Levels of AMR tend to be correlated with levels of antibiotic prescribing and, while there is no clear pattern, areas in the North West tend to have higher rates of prescribing compared with other parts of the country.

A more recent study looking at the spatial patterns of antibiotic prescribing rates in GP practices in England published in 2018 illustrated the association of potential clusters of high antibiotic prescribing with area level socio-economic deprivation. The analysis identified a number of hot and cold spots of antibiotic prescribing, with hot spots predominantly in the North of England.

Figure 3: Hot and cold spots of antibiotic prescribing in English GP practices, 2016.



Map A shows all GP practices. Map B shows the same data but excludes GP practices located in London. The analysis shows that hot spots of antibiotic prescribing occur predominantly in the North of England. Clusters of cold spots of antibiotic prescribing exist throughout the South and West of England. Spatial regression showed that patient catchments of hot spot practices were significantly more deprived than patient catchments of cold spot practices, especially in the domains of income, employment, education and health.

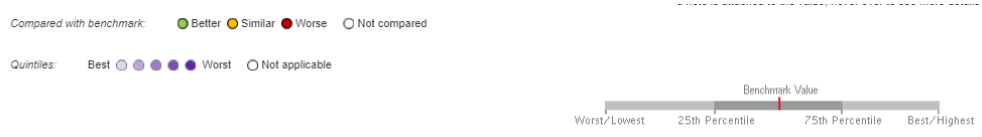
2 THE MANCHESTER PICTURE

Antimicrobial Resistance

The data in this section is drawn primarily from Public Health England's AMR local indicators tool. The tool includes 93 indicators covering AMR, AMU, healthcare-associated infections, infection prevention and control and AMS for individual CCGs and Acute Trusts. The data can be used by health and care staff, commissioners, Directors of Public Health, academics and members of the public to compare the situation in their local area to the national picture.

Most AMR statistics are published at the regional level. However, data on the percentage of blood and urine specimens containing E. coli tested for AMR and the percentage showing susceptibility to AMR are available for Manchester CCG.

Figure 4: E. coli AMR statistics for Manchester CCG (Quarter 1, 2019)



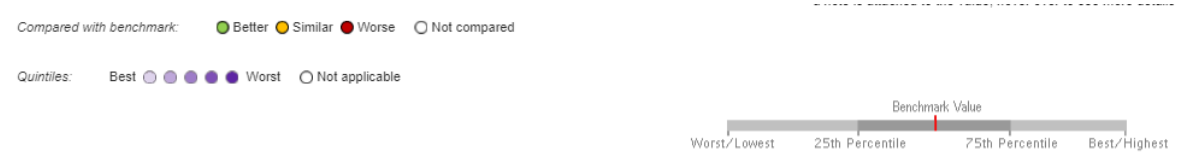
Indicator	Period	Manchester CCG		NHS region - local office	England	England		
		Count	Value	Value	Value	Worst/ Lowest	Range	Best/ Highest
Percentage of E. coli blood specimens with susceptibility tests to a carbapenem; by quarter <70 70 to <100 =100	2019 Q1	65	98.5%	98.6%*	96.5%*	0.0%		100%
Percentage of E. coli blood specimens with susceptibility tests to a 3rd Generation Cephalosporin; by quarter <70 70 to <100 =100	2019 Q1	66	100.0%	98.6%*	96.3%*	0.0%		100.0%
Rolling quarterly average proportion of E. coli blood specimens non-susceptible to 3rd generation cephalosporins; by quarter	2019 Q1	10	11.7%	13.6%*	14.0%*	60.4%		3.2%
Percentage of E. coli blood specimens with susceptibility tests to ciprofloxacin; by quarter <70 70 to <100 =100	2019 Q1	61	92.4%	94.3%*	93.5%*	0.0%		100.0%
Rolling quarterly average proportion of E. coli blood specimens non-susceptible to ciprofloxacin; by quarter	2019 Q1	17	21.8%	21.8%*	19.6%*	42.9%		0.0%
Percentage of E. coli blood specimens with susceptibility tests to gentamicin; by quarter <70 70 to <100 =100	2019 Q1	58	87.9%	93.8%*	95.7%*	0.0%		100%
Rolling quarterly average proportion of E. coli blood specimens non-susceptible to gentamicin; by quarter	2019 Q1	8	10.2%	11.6%*	10.5%*	28.6%		0.0%
Percentage of E. coli blood specimens with susceptibility tests to piperacillin/tazobactam; by quarter <70 70 to <100 =100	2019 Q1	60	90.9%	95.6%*	92.5%*	0.0%		100.0%
Rolling quarterly average proportion of E. coli blood specimens resistant to piperacillin/tazobactam; by quarter	2019 Q1	10	12.1%	9.0%*	8.4%*	35.4%		0.0%
Percentage of community E. coli (or coliform) urine specimens with susceptibility tests to trimethoprim; by quarter <70% 70% to 95% ≥95%	2019 Q1	922	96.4%	95.6%*	95.9%*	89.5%		100%
Percentage of community E. coli (or coliform) urine specimens non-susceptible to trimethoprim; by quarter	2019 Q1	251	27.2%	25.5%*	25.0%*	54.5%		0.0%
Percentage of community E. coli (or coliform) urine specimens with susceptibility tests to nitrofurantoin; by quarter <70% 70% to 95% ≥95%	2019 Q1	915	95.7%	95.4%*	95.3%*	79.9%		100%
Percentage of community E. coli (or coliform) positive urine specimens non-susceptible to nitrofurantoin; by quarter	2019 Q1	11	1.2%	2.4%*	3.2%*	-	*Insufficient number of values for a spine chart*	-
Rolling quarterly average proportion of E. coli blood specimens non-susceptible to at least 3 of the key antimicrobials; by quarter	2019 Q1	5	5.5%	6.6%*	5.7%*	28.6%		0.0%
Rolling quarterly average proportion of E. coli blood specimens non-susceptible to any 1 of the key antimicrobials; by quarter	2019 Q1	29	38.5%	33.9%*	33.4%*	97.6%		12.5%

Where data is of sufficient quality to allow benchmarking of an indicator to other areas, the figures show that Manchester had similar or better rates of susceptibility testing compared with the national average. A similar pattern can be seen for the percentage of bacterial samples that were susceptible to a range of antibiotics.

Antibiotic Consumption in Manchester

While nationally there has been a gradual decline in the number of antibiotics being prescribed, this decline is occurring more slowly in Manchester.

Figure 5: Antibiotic prescribing statistics for Manchester



Indicator	Period	Manchester CCG		NHS region - local office	England	England		
		Count	Value	Value	Value	Worst/ Lowest	Range	Best/ Highest
Total number of prescribed antibiotic items per 1000 resident individuals by quarter	2019 Q1	87,387	160.2	156.6	142.0	210.9		81.1
Twelve-month rolling total number of prescribed antibiotic items per 1000 resident individuals per day	Mar 2019	321,163	1.61	1.60	1.44	2.13		0.83
Total number of prescribed antibiotic items per STAR-PU by quarter	2019 Q1	93,138	0.28	0.28	0.25	0.33		0.15

The latest published figures for March 2019 (see Figure 5 above) show that the number of antibiotic items prescribed per day (based on a 12 month rolling total) in Manchester was 1.61 prescribed antibiotic items per 1,000 resident individuals per day in March 2019, down from 1.81 in March 2014. By comparison, the rate across England as a whole was 1.44 per 1,000 resident individuals, down from 1.75 per 1,000 individuals in March 2014.

In Quarter 1 2019, there were 160.2 prescribed antibiotic items per 1,000 resident individuals in Manchester. This is higher than the England value of 142.0 and is also slightly higher than the Greater Manchester figure of 156.6 prescribed antibiotic items per 1,000 (see Figure 6 below).

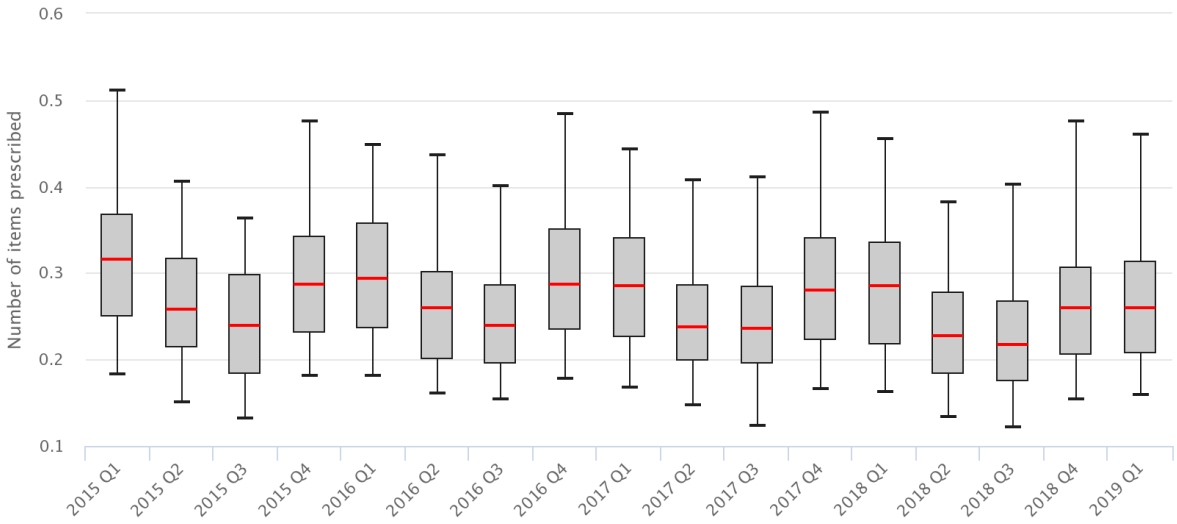
Figure 6: Total number of prescribed antibiotic items per 1,000 residents in Greater Manchester CCGs (Quarter 1 2019)

Area	Count	Value	95% Lower CI	95% Upper CI
England	7,897,926	142.0	-	-
Greater Manchester NHS region	443,501	156.6	-	-
NHS Oldham CCG	42,915	183.6	-	-
NHS Wigan Borough CCG	53,708	165.4	-	-
NHS Manchester CCG	87,387	160.2	-	-
NHS Stockport CCG	45,659	156.9	-	-
NHS Salford CCG	39,409	156.8	-	-
NHS Bolton CCG	43,707	153.5	-	-
NHS Bury CCG	28,857	152.2	-	-
NHS Heywood, Middleton And Rochdale CCG	31,971	146.3	-	-
NHS Trafford CCG	33,807	143.6	-	-
NHS Tameside And Glossop CCG	36,081	140.1	-	-

Manchester CCG has the third highest rate of prescribed antibiotic items per 1,000 residents in Greater Manchester (behind Oldham and Wigan CCGs). A similar trend can be seen when data were analysed looking at antibiotic items per STAR-PU.[1]

The chart below illustrates variations between GP practices in Manchester at different points in terms of the total number of prescribed antibiotic items per STAR-PU using data published in the National General Practice Profiles.

Figure 7: Total number of prescribed antibiotic items per STAR-PU by GP Practice (Quarter 1 2019)



The table below shows the minimum, maximum and median value for each of the points in time shown on the graph above.

	2016 Q1	2016 Q2	2016 Q3	2016 Q4	2017 Q1	2017 Q2	2017 Q3	2017 Q4	2018 Q1	2018 Q2	2018 Q3	2018 Q4	2019 Q1
Min.	0.15	0.14	0.11	0.15	0.13	0.09	0.07	0.11	0.08	0.07	0.07	0.09	0.09
Median	0.29	0.26	0.24	0.29	0.29	0.24	0.24	0.28	0.29	0.23	0.22	0.26	0.26
Max.	0.77	0.75	0.74	0.80	0.70	0.65	0.66	0.8	1.17	0.87	0.75	0.67	0.66

These figures illustrate the scale (range) of the variation between GP practices in Manchester in terms of antibiotic prescribing.

NHS England Quality Premiums (QP)

NHS England Quality Premiums (QP) are intended to reward clinical commissioning groups (CCGs) for improvements in the quality of the services that they commission and for associated improvements in health outcomes and reducing inequalities. For 2017-19 there was a Quality Premium for blood stream infections to support:

- Reducing Gram Negative Bloodstream Infections (GNBSIs) across the whole

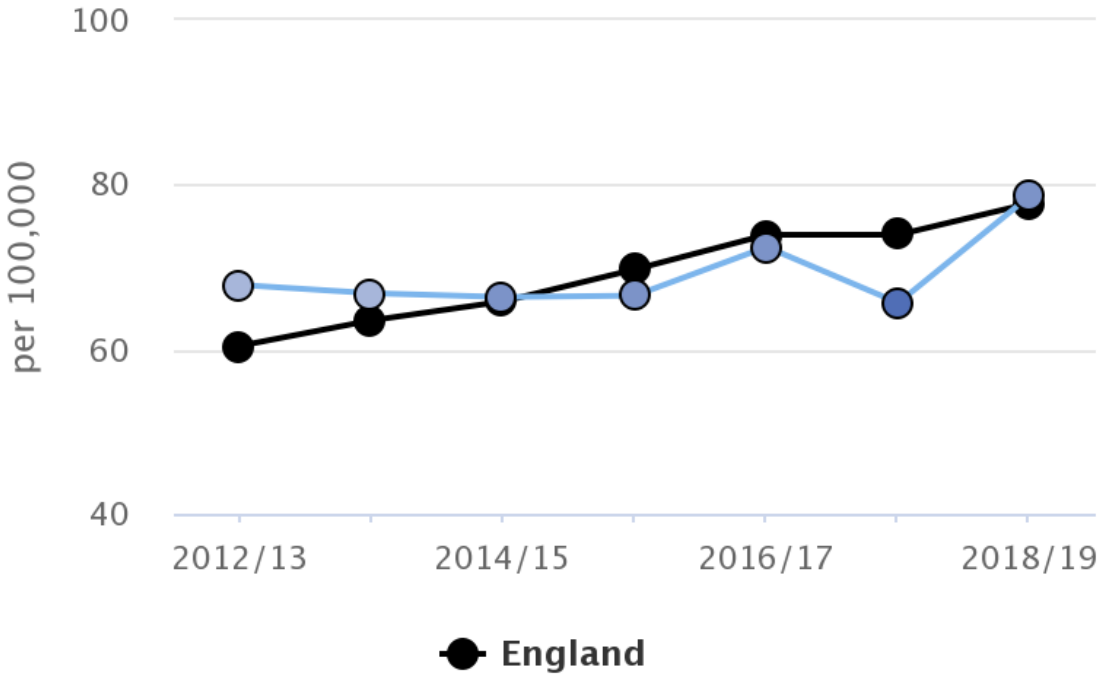
[1] STAR-PU (Specific Therapeutic group Age-sex Related Prescribing Unit) is a value used to adjust data to reflect the age and sex of distribution of patients in each practice or CCG.

health economy

- Inappropriate antibiotic prescribing in at risk groups (by reducing trimethoprim use for urinary tract infections (UTI) in primary care) as part of a sustained reduction in inappropriate prescribing in primary care

Targets were set to reduce E coli infections reported at CCG level by at least 10% by March 2019 compared with the 2016 baseline. Despite this ambition, rates of E coli infections have continued to rise, both in Manchester and across England as a whole. The graph below shows the annual rate of E. coli bacteraemia infections for NHS Manchester CCG (blue) compared to the England average (black).

Figure 8: E. coli bacteraemia rates by CCG (crude rate per 100,000 population)



Rates of E. coli BSI in Manchester compare similarly to those in other CCGs in Greater Manchester (see chart below).

Figure 9: E. coli BSI Rates, Greater Manchester CCGs (2018/19 financial year)

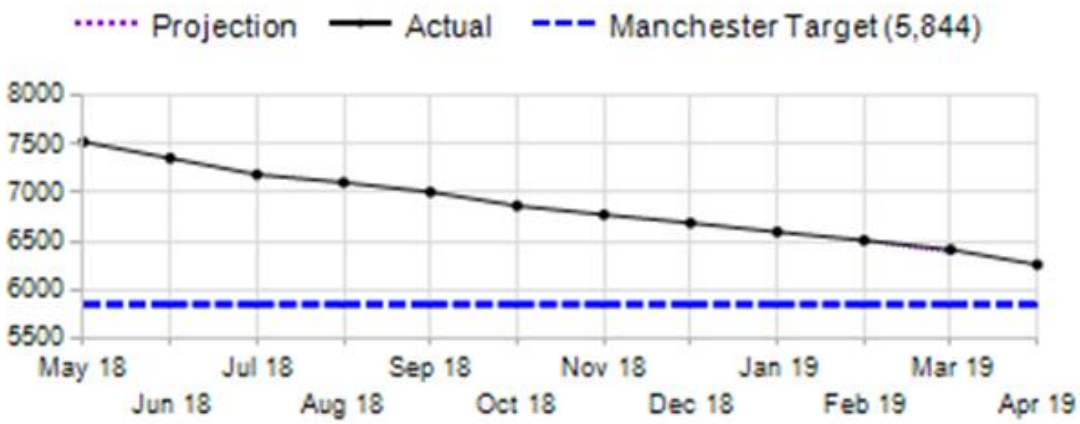
Area	Count	Value	95% Lower CI	95% Upper CI
England	39,837	77.7*	-	-
Greater Manchester NHS region	2,238	79.0*	-	-
NHS Tameside And Glossop CCG	231	89.7	-	-
NHS Bolton CCG	254	89.2	-	-
NHS Salford CCG	206	82.0	-	-
NHS Bury CCG	154	81.2	-	-
NHS Trafford CCG	187	79.4	-	-
NHS Stockport CCG	229	78.7	-	-
NHS Manchester CCG	429	78.6	-	-
NHS Oldham CCG	179	76.6	-	-
NHS Wigan Borough CCG	224	69.0	-	-
NHS Heywood, Middleton And Rochdale CCG	145	66.4	-	-

From Quarter 2 of 2017/18 onwards, MHCC was required to collect and report a core primary care data set for all E.coli infections in the Manchester as part of the Quality Premium. Following work on this in 2018/19, a system will be put in place to pilot this data collection in 2019/20.

The CCG showed significant progress across the antibiotic quality indicators for 2017/18 in respect of reducing inappropriate prescribing of trimethoprim for UTIs compared to nitrofurantoin and the reduction of trimethoprim items prescribed to patients over 70 years of age based on 2015-16 baseline data. This age group was selected as they have been identified as having the highest rates of E.coli bacteraemia infection in England. Manchester CCG also achieved a reduction in the total number of antibiotic items prescribed to below the NHSE target.

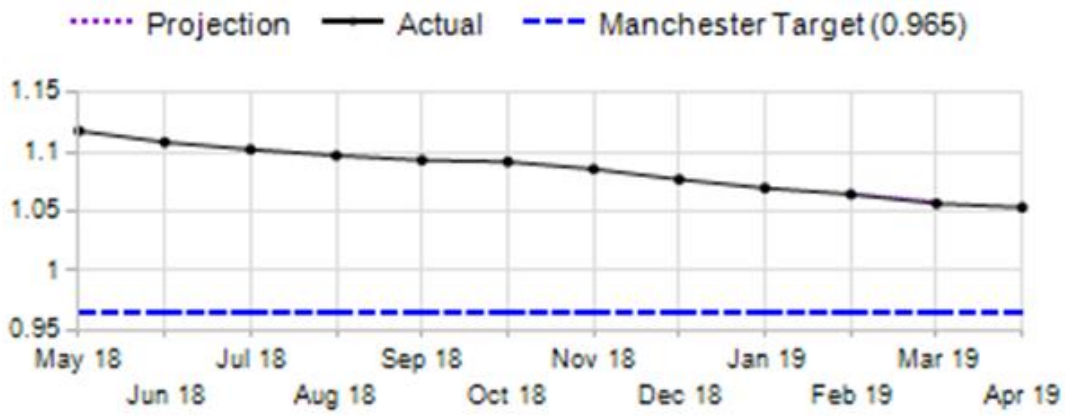
However in 2018/19 the NHSE target for number of trimethoprim items prescribed to patients aged 70 and over was further reduced by 30% and, whilst there was a trend of reduction in prescribing, the QP was not achieved (see Figure 11 below).

Figure 10: Number of trimethoprim items prescribed to patients aged 70 and over (rolling 12 month values and projection)



The 2018-19 QP target value for reduction in number of antibacterial items (based on 2013/14 prescribing rates) was further lowered to a prescribing rate of 0.965 items per STAR/PU or below. Whilst there was a reduction in prescribing, this target was not achieved by Manchester CCG (see Figure 11 below) or by any other CCG in Greater Manchester.

Figure 11: Number of antibacterial items per STAR/PU (rolling 12 month values and projection)



The Quality Premium prescribing target is to continue into 2019/20 and a stretched target to reduce by a further 15% by 2024 has been added.

Vulnerable Groups in Manchester

National data is not available against protected characteristics such as age and race or environmental influencing factors. However, it is possible to identify specific populations within Manchester that are particularly vulnerable to the effects of antimicrobial resistance.

In 2016, the commonest cause of BSIs was Escherichia coli. Of these, 41% were resistant to the commonest antibiotic used to treat infections in hospitals (co-amoxiclav) and almost one in five of these bacteria were resistant to at least one of other key antibiotics, though multi-drug resistance (resistance to three antibiotics) remained uncommon (<5%).

Patient risk factors for resistant bacteria include those who have received prior antibiotic courses, a history of recent or recurrent hospital admissions, the elderly and those living in long-term care facilities. The high levels of AMR in these subgroups also highlight the importance of taking patient clinical samples (especially blood and urine) prior to commencing antibiotics in patients who present with infections to the A&E department or while a hospital inpatient, in order to inform antibiotic treatment after the first 24-48 hours.

A particular concern among people experiencing homelessness is the spread of TB. It is estimated that 2% of homeless people in the UK have been infected by TB at some in their lives. Drug resistance is an increasing problem in TB and in recent years multi-drug resistant strains, resistant to all four of the drugs used to manage the infection, have been seen.

Lived experience

The Wellcome Trust has performed research looking into how members of the public perceive the use of antimicrobials and the issue of antimicrobial resistance. Although this research was not specific to Manchester, it does help to highlight a lack of understanding of when antimicrobials were indicated, the causes of antimicrobial resistance and the impact of individual prescriptions.

A common misbelief was that it is the individual who becomes resistant to the antimicrobial, and not the pathogen. This leads to the thought that as long as an individual doesn't take antimicrobials too often then resistance will not be a problem. There was also a widespread disbelief as to the severity of the problem, and an assumption that solutions would be found by further research.

'If you rely too much on antibiotics then your body gets used to them.'

I just know when I have been suffering for two or three weeks that I need more than Lemsip. They're stronger than anything else, it has to be antibiotics at this point.

Discussing the potential number of future deaths caused by antimicrobial resistance did not help people to appreciate the severity of the problem. Financial impacts were also either not believed, not felt to be personally relevant. Only when the issue could be related to personal experience by discussing resistant strains of bacteria that cause chest infections or diarrhoea was concern expressed.

Would be awful for UTIs. Antibiotics are the only thing that works.

This research clearly illustrates the need for public awareness and education campaigns. Reduced demand from patients for antimicrobials will help to reduce the number of inappropriate prescriptions.

3. WHAT WOULD WE LIKE TO ACHIEVE?

National Strategy and Policy

The UK Antimicrobial Resistance (AMR) Five Year Strategy was developed in 2013 and set out a series of actions to address the key challenges to AMR in order to slow and prevent the rise of antimicrobial resistant organisms.

In May 2016, the findings of an independent review on antimicrobial resistance, led by Lord O'Neill, were published. The final report included recommendations in 10 areas to tackle AMR across the globe, including:

- Infection prevention, control and surveillance: Limiting the development and spread of drug-resistance
- Tackling drug-resistant infections at a global level.
- Vaccines and alternative approaches: reducing our dependence on antimicrobials
- Antimicrobials in agriculture and the environment: reducing unnecessary use and waste
- Safe, Secure and Controlled: Managing the Supply Chain of Antimicrobials
- Rapid Diagnostics: Stopping unnecessary use of antibiotics
- Securing New Drugs for Future Generations – the Pipeline of Antibiotics

The review also includes ambitions to halve certain types of infection and to tackle inappropriate use of antibiotics.

In October 2018, the House of Commons Health and Social Care Committee published a report on Antimicrobial resistance. The report contains a number of recommendations relating to antimicrobial use in healthcare, including a call for NHS England to ensure that prescribing systems in all care settings make responsible prescribing of antimicrobials the default option.

In January 2019, the UK government published its 20-year vision for antimicrobial resistance. This sets out the national priorities in respect of antimicrobial resistance. These are:

- A lower burden of infection
- Optimal use of antimicrobials and good stewardship across all sectors,
- New diagnostics, therapies, vaccines and interventions

It outlines the intention to have a series of five-year UK national action plans to prioritise actions and direct resources based on the latest information on risks and effective interventions. The first 5-year national action plan for the period 2019-2024 reiterates the three priority areas as above

- reducing need for (i.e. lower burden of infection), and unintentional exposure to, antimicrobials
- optimising use of antimicrobials; and
- investing in innovation, supply and access.

The action plan also has a focus on improving global access to and development of new vaccinations.

The plan sets out four measures of success to ensure progress towards the government's 20-year vision. These include targets to:

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

Manchester's objectives

In keeping with these national targets, Manchester's objectives are to:

- Reduce overall levels of antimicrobial resistance found in the community
- Eliminate CPE resistance in Manchester
- Achieve national ambition target to reduce GNBSI by 50% by 2024.
- Achieve national antimicrobial reduction targets by reducing rates of inappropriate antimicrobial prescribing and optimising good practice

4. WHAT DO WE NEED TO DO TO ACHIEVE THIS?

Given the severity of the problem and the potential consequences, there have been large amounts of national policy, guidance and supporting materials published on antimicrobial resistance (AMR) and antimicrobial stewardship (AMS) in recent years. These provide some useful information on what we need to do in Manchester in order to achieve our objectives as set out in the previous section.

National Strategy and Policy

In broad terms, there are two key ways to reduce antibiotic use:

- Decrease infections through active immunisations of the population, reducing transmission of infection through effective prevention and control especially in healthcare delivery (in hospitals, community and long-term care facilities) and reduce the pool of asymptomatic individuals who can transmit to other individuals (e.g. the treatment of HCV).
- Reduce antibiotic use by driving improved use of diagnostic tools and tests, reducing unnecessary (i.e. "just to be safe") antibiotic use, improving the health of the population (e.g. less smoking reduces the impact of respiratory tract infections; less cancer reduces the need for antibiotics in cancer treatment).

The 5 year strategy sets outs of expectations for health and social care organisations working and includes recommendations for participation in international awareness days, introduction of point-of-care testing and creating guidelines for use in primary care. Much of this is already being done in Greater Manchester but these guidelines offer a structured list of actions to work towards implementing.

Best Practice Guidelines

NICE have published a variety of guidance centred on the areas of antimicrobial stewardship, behaviours, systems and processes, and prescribing (see table below). The purpose of these guidelines is to provide good practice recommendations for the effective use of antimicrobials.

Antimicrobial stewardship	https://www.nice.org.uk/guidance/qs121
Changing risk related behaviours in the general population	https://www.nice.org.uk/guidance/ng63
Systems and processes for effective antimicrobial medicine use	https://www.nice.org.uk/Guidance/NG15
Prescribing antibiotics	https://www.nice.org.uk/advice/ktt9

The need to follow NICE Guidance is a fundamental part of the NHS contract and Public Health England (PHE) and NICE have brought existing PHE and new NICE-PHE antibiotic prescribing guidelines together in a 'go-to' toolkit for prescribers in all care settings. The toolkit focuses on managing common infections, using evidence reviews to support appropriate antibiotic use and alternatives to antibiotics to manage symptoms where appropriate. Each guideline topic features a guideline, an

evidence review and a visual summary of the recommendations.

NICE have also recently endorsed PHE's tools to support the implementation of UTI guidelines in different contexts. Combined, these resources will help us meet the government's ambition to halve gram-negative bloodstream infections.

Quality Improvement Initiatives

There are two main quality improvement initiatives focused on reducing antibiotic prescribing, namely the Quality Premium and the Commissioning for Quality and Innovation (CQUIN) framework. The Quality Premium is intended to reward Clinical Commissioning Groups (CCGs) for improvements in the quality of the services they commission and for associated improvements in health outcomes and reducing inequalities, focussing on antibiotic prescribing. The Commissioning for Quality and Innovation (CQUIN) framework supports improvements in the quality of services and the creation of new, improved patterns of care across various health provider types, with a focus on reducing antibiotic prescribing in Acute Hospital Trusts.

The Quality Premium for 2017-19 had a focus on reducing Gram Negative Bloodstream Infections (GNBSIs) across the whole health economy and on tackling inappropriate antibiotic prescribing in at risk groups. Manchester's performance in respect of the Quality Premium targets for 2018/19 is described in Section 2 of this topic paper.

The Quality Premium for 2019/20 will focus on reducing the total number of prescribed antibiotics to the target set in 2018, with an added stretch to reduce antibiotic prescribing by a further 15% by 2024.

The CQUIN scheme for 2017-2019 had a specific focus on reducing the impact of serious infections due to antimicrobial resistance and sepsis as measured by a reduction in antibiotic consumption per 1,000 hospital admissions. This CQUIN scheme ended on 31 March 2019 and will become 'business as usual'.

The new CQUIN scheme for 2019-2020 is designed to support the NHS Long Term Plan priority around antimicrobial resistance and stewardship and focuses on the treatment of Lower Urinary Tract Infections (UTI) in older people and antibiotic prophylaxis in elective colorectal surgery. It is applicable to all acute hospitals providing UTI treatment and elective colorectal surgery. The scheme aims to reduce inappropriate antibiotic prescribing, improved diagnosis (by reducing the use of urine dip stick tests) and improved treatment and management of patients with a UTI. Implementing NICE guidance for surgical prophylaxis is designed to reduce the number of doses of antibiotics used for colorectal surgery and improve compliance with antibiotic guidelines.

Improvement in both of these areas is expected to deliver safer patient care, increase effective antibiotic use, which is expected to improve both patient mortality and length of stay.

Tools

PHE produces, develops and maintains key antimicrobial stewardship resources in primary care. These are available through the TARGET (Treat Antibiotics

Responsibly, Guidance, Education, Tools) toolkit that is accessible via the Royal College of General Practitioners website. The toolkit aims to help influence prescribers' and patients' personal attitudes, social norms and perceived barriers to optimal antibiotic prescribing and can be used by the whole primary care team within the GP practice or out of hours setting. Year-on-year the website receives increased numbers of visits, with almost 7,000 visits in October 2017 and over 8,000 visits in November 2017.

A national evaluation of TARGET demonstrated that 99% of CCGs actively promoted the TARGET Antibiotics Toolkit and were using the PHE common infection guidelines, while 94% of CCGs actively promoted TARGET patient leaflets. In addition, in November 2017, three of the TARGET 'Treating Your Infection' patient leaflets (for urinary tract infections and text-based and pictorial leaflets for respiratory tract infection) were endorsed by NICE.

The TARGET toolkit Primary Care Unit team have worked with general practitioners, the Royal College of General Practitioners (RCGP) Clinical Innovations Research Centre, the general public, patients, and other stakeholders to inform the need for and to develop resources to support the primary care antimicrobial Quality Premium.

PHE has also launched a national toolkit "Start smart then focus: Antimicrobial stewardship toolkit for English hospitals". This toolkit provides an outline of evidence-based antimicrobial stewardship in the secondary healthcare setting to help reduce inappropriate prescribing and optimise antibiotic use.

The Dental Subgroup of Public Health England's English surveillance programme for antimicrobial utilisation and resistance (ESPAUR), the Faculty of General Dental Practice (FGDP) and the British Dental Association (BDA) have developed a dental antimicrobial stewardship (AMS) toolkit for primary care. The toolkit contains a set of resources, guidance and tools to help primary care practitioners promote the appropriate use of antibiotics in dental care. By using the resources in the toolkit dental surgeries and practitioners can demonstrate compliance with the Health and Social Care Act 2008 Code of Practice on the prevention and control of infections and related guidance. The toolkit also supports recommendations made in the NICE guideline NG15 on systems and processes for effective antimicrobial medicine use.

More locally, the building rapid Interventions to reduce antimicrobial resistance and over prescribing of antibiotics (BRIT) project at the University of Manchester aims to develop and implement at scale the infrastructure for collecting and analysing data on antibiotic prescribing, clinical interventions and demographics of patients from GP practices, A&E departments and out-of-hours clinics, in order to better understand the public drivers for antibiotic prescribing. This will enable the project team to develop and test simple interventions to refine antibiotic prescribing in locations, facilities or sub-groups (of patients and/or clinicians).

The primary outcome of the project is to achieve a clinically important (and statistically significant) reduction in antimicrobial prescribing over time by implementing a data and team-science infrastructure within the NHS that is acceptable, timely and supported by users meeting scientific conditions and can be re-applied easily and efficiently at low cost for other prescribing areas.

The BRIT programme has also focused on the establishment of an online knowledge platform - an easy-to-understand dashboard style early warning system that is capable of monitoring prescribing practices and optimising patterns of prescribing. The platform will allow GP practices to find out how they compare to other practices and where it can improve, which kind of patients need to be given antibiotics more frequently and whether the practice been improving over time. Another feature of the dashboard is risk profiling where a patient's risk of an infection-related complication can be identified in a 30-day window. Over-prescribing to low-risk patients or under-prescribing to high-risk patients can also be visualised.

A national level dashboard is currently being rolled out. This will be followed by the release of a more bespoke dashboard for participating GPs. MHCC is currently in talks with University of Manchester to explore the potential for getting GP Practices in Manchester signed up to using this tool.

Education and Training

There are a variety of educational and training resources now available for the general public and healthcare staff. These include:

- Massive open online course (MOOC) on antimicrobial stewardship: This resource provides a free online education tool intended to help healthcare professionals understand what antimicrobial stewardship is and how they can apply it every day.
- e-Bug: e-Bug is an educational resource for children and young people on hygiene, spread of infection and antibiotics developed by Public Health England (PHE). It consists of an interactive and multi-lingual website alongside a comprehensive collection of teaching packs for use in schools and the community. The e-Bug resources were endorsed by NICE in 2016 and are currently available in over 30 different languages and in 26 countries globally. All material is linked to the English national curriculum. In November 2017, the e-Bug 'Antibiotics Explained' YouTube video received 15,300 views and its World Antibiotic Awareness Week social media campaign gained 62.3k impressions on Twitter.
- Antibiotic Guardian: This is a campaign led by PHE which urges members of the public and healthcare professionals to take action in helping to slow antibiotic resistance by taking a pledge about how they can personally prevent infections and make better use of antibiotics to help protect these vital medicines. By the end of 2017, there were 57,000 Antibiotic Guardian pledges from 129 countries. The website and pledges are available in 5 languages, for human and animal health professionals, healthcare system leaders and organisations, healthcare students and engaged members of the public.
- Antibacterial resistance - a global threat to public health: This is a learning programme for pharmacists and technicians about the issues of antimicrobial resistance and healthcare-associated infections (HCAIs) and the important role of the pharmacy team in supporting healthcare professionals and patients to optimise patient outcomes in antimicrobial therapy, while minimising harm.
- Reducing antimicrobial resistance e-learning course: This resource provides

an educational tool intended for all health and social care staff (both clinical and non-clinical), to improve infection prevention and control practices and antimicrobial stewardship programmes. This in turn can reduce healthcare-associated infection and antimicrobial resistance.

5. WHAT ARE WE CURRENTLY DOING?

The following section describes some of the work that is happening in Manchester to help the city achieve its objectives as set out in Section 3.

Reducing levels of antimicrobial resistance in the community

Manchester's Community Infection Control Team helps keep the people of Manchester safe from disease through the promotion of preventative measures.

This service provides infection prevention and control advice and support in the community, which includes primary care and social care providers such as GPs, dental practices and nursing homes. The service audits infection control practices and service improvement plans, and provides education, training, and support to providers to improve hygiene and infection prevention and control. The service works across the health and social care system to respond to cases, clusters and outbreaks of communicable disease in the community in order to manage, control and reduce the risk of infection.

Manchester has a relatively high incidence rate of TB compared to England and resistant and multi-drug resistant strains are a concern. Work has continued around TB prevention through the introduction of a Latent TB screening programme. This has contributed to a significant drop in the number of active cases recorded in the city, with 25% less cases of TB recorded since the programme began in 2014.

Vaccines play a key role in tackling antimicrobial resistance through promoting herd immunity and reducing the prevalence of infection. The Greater Manchester Health and Social Care Partnership Screening and Immunisation Team are responsible for implementation and monitoring of national vaccination programmes for children and adults in Manchester. The Director of Public Health has oversight and scrutiny of the programmes and Manchester's uptake rates.

Reducing Gram Negative Blood Stream Infections

A Manchester Gram Negative Blood Stream Infection (GNBSI) Reduction Ambition Group has been established to promote cross sector work to help realise the national ambition of reducing GNBSI as set out in the latest Quality Premium. The group includes representatives from Manchester Health and Care Commissioning (MHCC), as well as providers of acute and community health services.

The group has been advised by national leads for GNBSI to develop the work plan and current priorities are to further develop surveillance of GNBSI, better understand local risk factors and promote good practice in the prevention, assessment and management of urinary tract infections (UTIs) across the health and care economy as this is where the biggest impact can be made.

Work on UTIs has included:

- producing a 'Focus on UTI' update for GP practices that contains guidance on UTI as well as individual practice prescribing data. This update was also promoted to practices as part of a video presentation that is mandatory for practices to view.
- developing a catheter passport to promote continuity of good catheter care across health and social care settings
- developing training and guidance for care homes and home care services to establish better practice around hydration and recognising and managing suspected UTIs (including dip or not to dip guidance).
- delivering messages to the public on the importance of hydration

Reducing inappropriate antimicrobial prescribing and optimising good practice

The Medicines Optimisation Team in Manchester Health and Care Commissioning (MHCC) is working with the MHCC GP clinical lead to develop a strategy to support antimicrobial stewardship in primary care and is working collaboratively across the whole health economy to deliver the strategy and improve antimicrobial stewardship.

The team works to:

- Support the safe and appropriate prescribing of antibiotics in primary care
- Support achievement of the Medicines Optimisation element of the Quality Premium, focusing on reducing Gram Negative Bloodstream Infections (GNBSIs) and appropriate antibiotic prescribing in at risk groups in line with national guidelines and Quality Premium targets
- Support practices to prescribe antibiotics in a timely, safe manner
- Monitor prescribing and share data using a number of resources including the Business Intelligence (BI) toolkit, Epact2, GP EMIS system and data provided via third parties e.g. fingertip and DCS surveillance
- Promote Public Health England (PHE) health messages (specific to antibiotics) by working with the Communications and Engagement Team
- Support training and education cross Health and Social Care settings

The work of the Medicines Optimisation Team in respect of antimicrobial resistance has previously included:

- Contributing to the development and regular updating of the Greater Manchester Medicines Management Group (GMMMG) antibiotic guidelines
- Disseminating the GMMMG Antibiotic Guidelines to practices
- Developing clinical audits to be undertaken within the next 6 months
- Reviewing of prophylactic prescribing for urinary tract infections (UTIs)

- Undertaking a ‘real time’ review of prescribing for acute UTIs
- Promotion of self-care and support signposting of patients
- Supporting the GNBSI agenda for the CCG and attend/contribute to the GNBSI working group at CCG level
- Supporting GP practices that are identified as high prescribers of antibiotics
- Supporting the Sepsis Clinical Lead with prescribing data for ‘practice sepsis packs’ (current work in progress)
- Supporting the Sepsis Clinical Lead where possible with Medicines Optimisation queries/workflow

Providers of health and care services in the city, including Manchester Foundation Trust (MFT) and Greater Manchester Mental Health (GMMH) Foundation Trust, are also developing and refining their strategies and processes in respect of infection prevention and antimicrobial stewardship, which will also contribute to the broader strategic aim of minimising inappropriate antimicrobial prescribing and reducing Gram Negative Bloodstream Infections.

Education and engagement

Informing the public and healthcare staff is of paramount importance in tackling AMR. Manchester’s Community Infection Control team have held educational events which has included sessions on Influenza, oral health and dehydration in the elderly, which can contribute to urinary tract infections, a leading cause of resistant E. Coli infections.

Public Health England, NHS England and medicine optimisation teams have developed approaches to reducing the unnecessary prescribing or misuse of antibiotics, including supporting the Antibiotic Guardian campaign (established by Public Health England).

This campaign encourages individuals to pledge to commit to the responsible use and prescribing of antibiotics. Greater Manchester has seen high levels of engagement with this campaign. Currently there are 37 Antibiotic Guardians per 100,000 people in the region. This is higher than the England average of 20.7.

Alongside engaging prescribers, work on educating the general population about the significant of antimicrobial resistance and stewardship is important. It can be challenging when individuals put pressure on prescribers to give out antimicrobials

and better understanding of the appropriate use of antimicrobials may help to improve this. Antibiotics awareness events are held by various local hospitals, but there may be opportunity to expand on this throughout the region. This fulfils a recommendation made by the UK 5 Year Antimicrobial Resistance Strategy to participate in events like these.

The national 'Keep Antibiotics Working' campaign was first launched in October 2017. More than 750,000 Keep Antibiotics Working posters and leaflets were distributed to a range of partners including local authorities, health care centres and Housing Associations. Other materials that PHE produces, such as Antibiotic Guardian and TARGET were rebranded in line with this campaign.

In 2018, PHE launched the second year of the national 'Keep Antibiotics Working' campaign across the North West, highlighting the risk of taking antibiotics when they are not needed and urging people to always take healthcare professionals' advice as to when they need antibiotics. The campaign also provided effective self-care advice to help individuals and their families feel better if they are not prescribed antibiotics. Manchester City Council and Public Health England are working in partnership to widely promote the campaign to staff and the public.

The Greater Manchester Medicines Management Group (GMMMG) is responsible for the appropriate use of medication across Greater Manchester. All CCGs in Greater Manchester are now using the same GMMMG antimicrobial guidance, which will help to ensure that all patients with infections across Greater Manchester will get treated with antimicrobials that are likely to be effective.

6 OPPORTUNITIES FOR ACTION

Governance and strategy

MHCC have established a new overarching IPC Oversight Group to oversee AMR, Sepsis and GNBSI work streams with representation from MHCC, Manchester Foundation Trust (MFT), the Manchester Local Care Organisation (MLCO), Public Health England (PHE) and infection prevention teams. The group will help to ensure that there is a cohesive approach to infection prevention and antimicrobial stewardship across the whole health and social care sector and will lead the work to develop a strategy to support antimicrobial stewardship in primary care. It will also work collaboratively across the whole health economy to deliver the strategy.

The group should interface with innovators, including the University of Manchester and Health Innovation Manchester, to look at piloting innovations such as point-of-care testing, feedback mechanisms, risk algorithms, electronic prompts in clinical systems and rolling these our more widely as appropriate.

Antimicrobial use

In line with the recommendations of the House of Commons Health and Social Care Committee's report on Antimicrobial resistance, MHCC should aim to:

- Set more challenging local targets for primary care and for rapid review and withdrawal of clinically unnecessary secondary care prescribing (para. 49)
- Work to ensure that prescribing systems in all care settings make responsible, evidence-based, prescribing of antimicrobials the default option through regular audits using the TARGET toolkit and reviewing all long term prophylaxis with input from the Medicines Optimisation Team (para. 52)
- Consider the use of digital health tools for clinicians and policymakers in order to increase the quality, safety, and cost effectiveness of clinical care and reduce the variation in uptake of best practice through better access to guidelines and prompts in clinical systems, new and existing diagnostic risk algorithms (such as FeverPAIN for the assessment of acute sore throats) plus links to the revised National Early Warning Score (NEWS2) (para. 53)
- Encourage the development of rapid diagnostic testing and use of diagnostic tests based on NICE guidance. Where testing is clinically appropriate and recommended by NICE, action should be taken to address the perverse financial incentives which may discourage their use (para. 55)

MHCC should also consider looking at other diagnostic algorithms, such as the National Early Warning Score (NEWS2) to support the improved recognition of severe sepsis and the detection of likely sepsis.

Vaccination

Work with the MHCC Communications and Engagement Team to better understand religious, cultural and other barriers to improving uptake of the national vaccination programmes for children and adults in Manchester and use this insight to maximise opportunities at a neighbourhood level to raise awareness of the importance of the uptake of immunisations and vaccinations for individuals and the population as a whole in partnership with the Greater Manchester Health and Social Care Partnership Screening and Immunisation Team.

Community Pharmacies

MHCC should consider whether there is an expanded role for communities pharmacies in supporting this area of work. Some areas of the country have a locally commissioned service from community pharmacy that provides daily supervised administration of TB medicines. This can be of particular benefit for some patient groups and requires contact with the prescribing team if one day is missed. A similar approach could be adopted for UTIs in the under 65s.

Gram Negative Blood Stream Infections

MHCC should:

- Continue to work with the whole health and social care system to further embed good quality practice including nutrition and hydration; continence; diagnosis and management of UTIs.
- Work with Public Health partners to further promote prevention awareness to populations, particularly older people who are more likely to develop these infections. This will include promoting hydration, continence management and hand hygiene.
- Consider how the "Take a Seat" campaign could be rolled out across local businesses and community premises. This campaign aims to make high streets more age-friendly by providing access to seats, toilet and hydrating drinks.

MHCC should continue to work with national leads for GNBSI reduction to identify and share good practice that is effective in reducing infections.

Data and analysis

The Manchester Care Record has the potential for providing better links to diagnostic tools and scripts for clinicians as well as improving the consistency of patient information in respect of antibiotic prescribing. This would help address the situation where a GP practice refuses to prescribe antibiotics but a patient then chooses to go to an A&E Department, Walk in Centre or Out of Hours provider and is given a script by a different clinician.

More work is needed to develop our understanding of AMR-related data in terms of how Manchester performs compared with national and statistical neighbour trends as well as protected characteristics and environmental influencing factors. This should form part of the action plan underpinning the work of the IPC Oversight Group.

Innovation

Manchester is well placed to make the most of a number of innovations surrounding finding new antimicrobials and protecting the ones that we have:

- In 2016, NHS England launched a Health Care Innovation Scheme which offers financial rewards to CCGs in response to actions taken to reduce antimicrobial resistance. Rewards of up to £150,000 per year, for an average sized CCG, are given if antibiotic prescription rates are reduced by 4% from levels in 2012/13. Money can also be gained via the effective monitoring and sharing of data on antimicrobial use, and by ensuring that antibiotic prescriptions are reviewed within 72 hours of being started. This offers an

incentive for both GP practices and hospitals within Greater Manchester to reduce prescriptions.

- Manchester contains one of Europe's largest and most developed clinical academic campuses. It includes the UK's largest NHS provider trust, two of the country's leading universities and a host of industry partners drawn by ready access to talent, a diverse patient base and world-class facilities. The University of Manchester and Manchester University NHS Foundation Trust (MFT) are both shareholders in the Manchester Science Partnerships (MSP) which is integral to Manchester's opportunity.

- The Antimicrobial Resistance Centre was established in May 2016 and is a key part of the UK's response to the global threat from Antimicrobial Resistance. Although based at Alderley Park in Cheshire, the centre has strong academic links with Manchester. The AMR Centre is a joint private-public initiative to support/accelerate the development of new antibiotics and diagnostics through a fully integrated development capability, offering translational R&D from pre-clinical hits through to clinical proof of concept and significant growth has been experienced by the Medicines Discovery Catapult, both of whose respective work in antimicrobial resistance and drug discovery is of global significance.

Evaluation

MHCC should build on the work of the BRIT programme at the University of Manchester to consider the development of an approach to evaluate the effectiveness of local interventions in optimising antibiotic prescribing. One of the challenges with the target-driven strategy of reducing antibiotic by 4% (Quality Premium) is that higher levels of antibiotic prescribing have been associated with better short term outcomes (in the BRIT, general practices that prescribe more have lower rates of hospital admissions for infection-related complications). Given this, it will be important to evaluate whether the GM strategy for AMR results in better clinical outcomes in addition to lower levels of antibiotic prescribing. We will work with NICE and the University of Manchester to develop this strategy for evaluation.

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8 OTHER RELATED JSNA TOPICS

- Homelessness and Health

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Date: October 2019

It is hoped that you have found this topic paper useful. If you have any comments, suggestions or have found the contents particularly helpful in your work, it would be great to hear from you.

Responses can be sent to jsna@manchester.gov.uk