Public Health England

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Laboratory confirmed pertussis in England: data to end-May 2016 *

This news report presents current pertussis activity to 31 May 2016, updating the previous report that included data to the end of March 2016 [1].

Background

In England the total number of laboratory confirmed cases of pertussis has fallen each consecutive year from a peak of 9367 cases in 2012; by 51% between 2012 and 2013 (4621 cases) and 27% between 2013 and 2014 (3387 cases). The number of confirmed cases reported in 2015 was 24% higher than in 2014 but remained lower than 2012 and 2013 (see figure). Cases of pertussis have continued to increase in the first five months of 2016.

The pertussis vaccination in pregnancy programme was introduced in October 2012 [2,3] in response to a national outbreak and a significant increase in infant cases and deaths. Evaluation of the programme has demonstrated its safety and high effectiveness [4,5,6]. Together with coverage and epidemiological data, these findings informed the JCVI decision in July 2014 that it should continue for at least a further five years [7].

From 1 April 2016 the recommended gestational age for vaccination was revised to between 16-32 weeks (previously recommended from 28-32 weeks) to offer more opportunities for women to be vaccinated. For operational reasons, pertussis vaccination should be offered from around 20 weeks on, or after the foetal anomaly scan [7].

Pertussis vaccine coverage in pregnant women increased from 59.7% in January 2016 to 60.7% in March 2016. Coverage was 4.4% higher in March 2016 compared to March 2015, and 2016 is the first year of the programme where coverage has not declined during the first quarter [8].

Confirmed cases in January-May 2016

From January to May 2016, 2201 laboratory confirmed cases were reported across all ages to the enhanced surveillance programme in England compared to 1362 in the same period in 2015.

* First published as a news report, without figure and table.

Total cases for the first five months of the year were higher in 2016 than for the same period each year since 2011 with the exception of 2413 cases in 2013 (see table). Overall pertussis activity in England persists at raised levels compared to the years preceding the outbreak in 2012 (see figure and table).

Pertussis activity in all infants under one year of age was low in the first five months of 2016 (table), with 91 cases, but higher than the equivalent periods in each of the last three years (56, 47 and 46 cases in 2013, 2014 and 2015 respectively). Disease incidence, as expected, continued to be highest in infants less than three months but cases were lower in January-May 2016 than during the equivalent period in the 2012 peak year and remain in line with that seen in the years before the outbreak began. There have been two deaths in infants with pertussis confirmed in the first five months of this year. Sixteen deaths have therefore now been reported in young babies with confirmed pertussis who were born after the introduction of the pregnancy programme on 1 October 2012, as at end May 2016. Fourteen of these 16 babies were born to mothers who had not been vaccinated against pertussis, all of the 16 babies were too young to be fully protected by vaccination themselves and only one had received their first dose of pertussis-containing vaccine.

The numbers of laboratory confirmed cases in those aged one year and older continued to be higher than those reported before the 2012 outbreak. Pertussis cases in those aged 10 years and older were higher in the first five months of 2016 than the totals confirmed in 2014 and 2015. In those aged 1-9 years however cases to end May 2016 (37 aged 1-4 years and 133 aged 5-9 years) were higher than those confirmed to the same point in any previous year including 2012 (table).

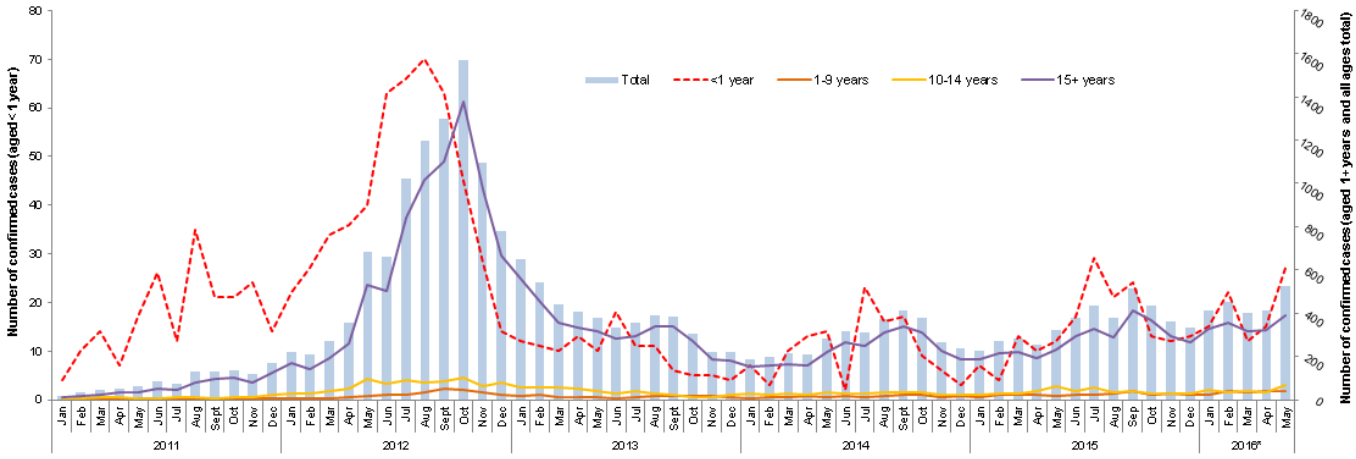
Overall trends as at end-May 2016

Overall pertussis activity was relatively high in the first five months of 2016 in all regions of the country and in all age groups, in particular in children aged 1-9 years. Whilst cases in infants less than six months have increased in January to May 2016, the numbers still remain low despite the continued high activity in older age groups (table). The immunisation programme for pregnant women continues to be important, particularly in light of the ongoing raised levels of pertussis in those over one year of age and recent infant deaths.

PHE guidelines

Revised Guidelines for the Public Health Management of Pertussis in England are now available on the PHE website [9].

Provisional number of laboratory confirmed cases of pertussis in England by age group and month: January 2011 to May 2016



Number of laboratory confirmed cases in England, 2008-2016 by age group: January to May

Year	Month	<3 months	3-5 months	6-11 months	1-4 years	5-9 years	10-14 years	15+ years	All ages
2008	Jan - May	62	13	2	11	8	57	155	**308**
2009	Jan - May	45	13	–	9	4	33	137	241
2010	Jan - May	21	3	–	2	5	22	78	131
2011	Jan - May	41	9	2	4	5	30	121	212
2012	Jan - May	136	21	2	7	37	242	1295	1740
2013	Jan - May	42	13	1	27	45	264	2021	2413
2014	Jan - May	37	5	5	11	48	137	852	1095
2015	Jan - May	33	7	6	25	65	180	1046	1362
2016*	Jan - May	65	17	9	37	133	225	1715	2201

*2016 are provisional data

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Mandatory MRSA, MSSA and *E. coli* bacteraemia and *C. difficile* infection data (England): up to and including financial year 2015 to 2016

PHE's latest annual data, and latest Annual Epidemiological Commentary, on trends in reports of Staphylococcus aureus (MRSA and MSSA) and *Escherichia coli* bacteraemia, and of *Clostridium difficile* infections, mandatorily reported by NHS acute Trusts in England up to financial year (FY) 2015/16, have been published on the GOV.UK website [1,2].

The data and commentary, including tabular and graphical information, update the previous report published on 9 July 2015. Some key facts are listed below.

MRSA MSSA and *E. coli* bacteraemias

A total of 819 cases of MRSA bacteraemia were reported by NHS acute trusts in England between 1 April 2015 and 31 March 2016. This is an increase of 2.4% from 2014/15 (800 cases), and a decrease of 81.6% from 2007/08 (4,451 cases).

Since April 2013, all MRSA cases have been subject to a Post Infection Review (PIR) [3]. The data on the PIR show a consistent decline in the rates of CCG-assigned cases from 0.8 cases per 100,000 population in 2013/14 to 0.5 cases per 100,000 population in 2015/16. Rates of trust-assigned MRSA bacteraemias fell from 1.2 cases per 100,000 bed days in 2013/14 to 0.9 in 2014/15, after which trust-assigned rates remained steady at 0.9 in 2015/16. The rate of third party assigned cases has increased from 0.2 to 0.4 per 100,000 population. Some of the decline seen in the rates of CCG or trust-assigned cases will have been due to the introduction of third party assignment.

A total of 10,586 cases of MSSA bacteraemia were reported by NHS acute trusts in England between 1 April 2015 and 31 March 2016. This is an increase of 7.5% from 2014/15 (9,845 cases), and an increase of 20.7% from 2011/12 (8,767 cases). The rate of all MSSA cases per 100,000 population, per year has risen from 16.4 in 2011/12 to 19.4 in 2015/16. In contrast to the all-MSSA case rate, the incidence rate for trust-apportioned MSSA cases has remained approximately stable (from 8.1 in 2014/15 to 8.4 per 100,000 bed days in 2015/16, a change of 3.6%).

A total of 38,132 cases of *E. coli* bacteraemia were reported by NHS trusts in England between 1 April 2015 and 31 March 2016. This is an increase of 6.6% from 2014/15 (35,764 cases), and an increase of 18% from 2012/13 (32,309 cases). The rate of *E. coli* cases per 100,000 population has risen from 60.4 in 2012/13 to 70.1 in 2015/16.

Unlike the interventions for MRSA that were hospital and device related, effective interventions for MSSA and *E. coli* bacteraemia will need to include the community setting if we are to see the magnitude of reductions seen with MRSA.

Clostridium difficile infections

A total of 14,139 cases of *Clostridium difficile* infection were reported by NHS trusts in England between 1 April 2015 and 31 March 2016. This is a decrease of 0.4% from 2014/15 (14,192 cases), and a decrease of 74.5% from 2007/08 (55,498 cases). The rate of all CDI cases per 100,000 population, per year has fallen from 107.6 in 2007/08 to 26.0 in 2015/16.

Of the 14,139 total cases reported in FY 2015/16, 5,164 were trust-apportioned (14.9 per 100,000 bed-days). The trends in incidence rate for trust-apportioned CDI cases has been steeper than that for all cases, with rates declining between 2007/08 and 2013/14 and then remaining stable over more recent FYs (up to and including 2015/16). The rate of trust-apportioned CDI cases decreased from 15.1 in 2014/15 to 14.9 in 2015/16, a change of just 1.5%.The number of trust-apportioned cases fell from 33,434 cases in 2007/08 to 5,164 cases in 2015/16, a decline of 84.5%. The number of non-trust-apportioned cases fell by 59.3% from 22,064 in 2007/08 to 8,975 in 2015/16.

The recently observed increases and subsequent levelling off of CDI numbers and rates are currently under investigation and PHE is working closely with the NHS and the wider health service to look for any underlying reasons. In particular, the proportion of infections that detected in the community that maybe associated with recent hospital stays. It is however, important to remember that these recent increases are very minor in magnitude compared to the large and rapid declines observed in earlier years.

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   - C. difficile infections.

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HIV-STIs

Unlinked anonymous HIV and viral hepatitis monitoring among PWID: 2016 report

New data from the ongoing Unlinked Anonymous Monitoring Survey of HIV and Viral Hepatitis among People Who Inject Drugs (PWID) have been published on the PHE website; the updated sets of tables present data for the period 2005 to 2015 inclusive [1]. Data from 1990 to 2004 inclusive can be found in previous years' data tables [2]. In addition to data for the whole of England, Wales and Northern Ireland (the areas covered by this survey), the tables include data for each country and the regions of England. This year, data tables for the second wave of the biennial (two-yearly) sub-survey of people who inject image and performance enhancing drugs are also being published.

This article presents an overview of the trends between 2005 and 2015 for HIV, hepatitis B, hepatitis C and risk behaviours from the main Unlinked Anonymous Monitoring Survey, which is targeted at people who inject psychoactive drugs, such as, heroin, crack cocaine and amphetamines. Further data from this survey related to hepatitis C will be reported in the Hepatitis C in the UK: 2015 report [3] later this month. The findings from the second routine sub-survey of people who inject image and performance enhancing drugs are also summarised.

HIV among people injecting psychoactive drugs

The prevalence of HIV among the 2,721 PWID who took part in the main Unlinked Anonymous Monitoring Survey across England, Wales and Northern Ireland in 2015 was 1.0% (95% CI, 0.66%-1.4%). Between 2004 and 2014, prevalence varied between 1.1% and 1.6% (see figure 1; and table 1 of the dataset). The HIV prevalence in Wales was 0.77% (95% CI, 0.03%-2.9%) and in Northern Ireland 0.65% (95% CI, 0.01%-4.0%) during 2015. In England, the HIV prevalence was 1.0% (95% CI, 0.66%-1.5%) in 2015 and this was not significantly different from that found in 2005 when the prevalence was 1.6% (95% CI, 1.2%-2.1%; see table 11 of the data set; and statistical note a).

The HIV prevalence among “recent initiates” to injecting drug use (those who first injected during the preceding three years) is an indicator of recent transmission. The prevalence of HIV among the recent initiates taking part in the survey across England, Wales and Northern Ireland varied over time and ranged from 0.37% to 2.6% between 2005 and 2015. In 2015, the prevalence in this group was higher, but not significantly, than in previous years at 2.6% (95% CI, 1.1%-5.7%; see figure 1; table 26 of the dataset; and statistical note b). In 2015, those with HIV in this group were men who reported having sex with men during the preceding year. The elevated prevalence of HIV in this group during 2015 therefore most probably reflects the increase in injecting drug use that has recently been seen among some groups of men who have sex with men many of whom are HIV positive [4,5]. This probably does not reflect an increase in the level of HIV transmission among PWID overall, where injecting drug use was the underlying route of transmission.

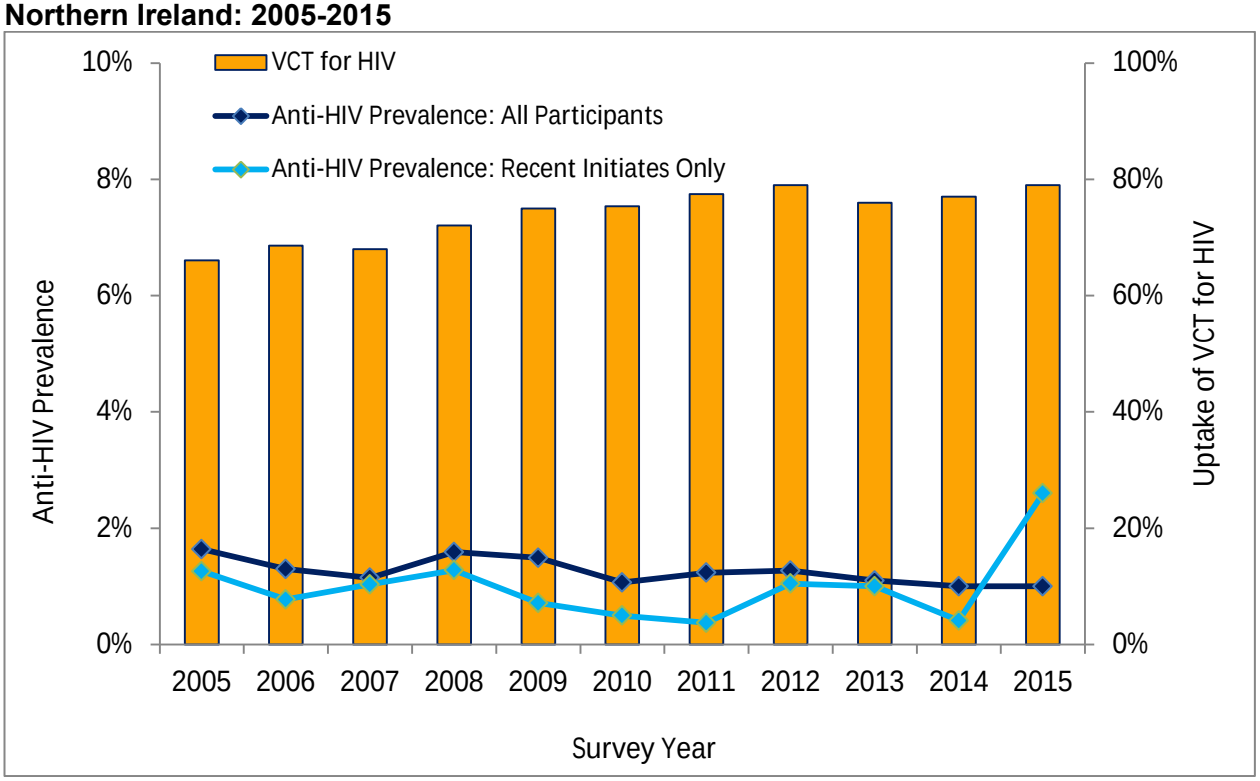
The self-reported uptake of voluntary confidential testing (VCT) for HIV among the survey participants across England, Wales and Northern Ireland has increased significantly since 2005; rising from 66% (95% CI, 64%-68%) in 2005 to 79% (95% CI, 77%-80%) in 2015 (see figure 1; table 7 of the dataset; and statistical note c). The proportion of the participants with antibodies to HIV, who answered the questions on the uptake of VCT for HIV, reporting that they were aware of their HIV infection was 84% (95% CI, 65%-94%) in 2015 (see table 7 of the dataset).

Hepatitis B among people injecting psychoactive drugs

The prevalence of antibodies to the hepatitis B core antigen (anti-HBc, a marker of past or current infection with hepatitis B) among the survey participants across England, Wales and Northern Ireland has declined since 2006. During the period 2005 to 2006 the anti-HBc prevalence fluctuated between 26% and 28%, before significantly declining to 13% (95% CI, 12%-14%) in 2015 (figure 2; table 2 of the dataset; and statistical note d). By country, anti-HBc prevalence in 2015 was as follows: Northern Ireland, 6.5% (95% CI, 3.5%-12%, table 25); Wales, 11% (95% CI, 7.5%-15%; table 24 of the dataset); and England, 14% (95% CI, 12%-15%; table 11 of the dataset).

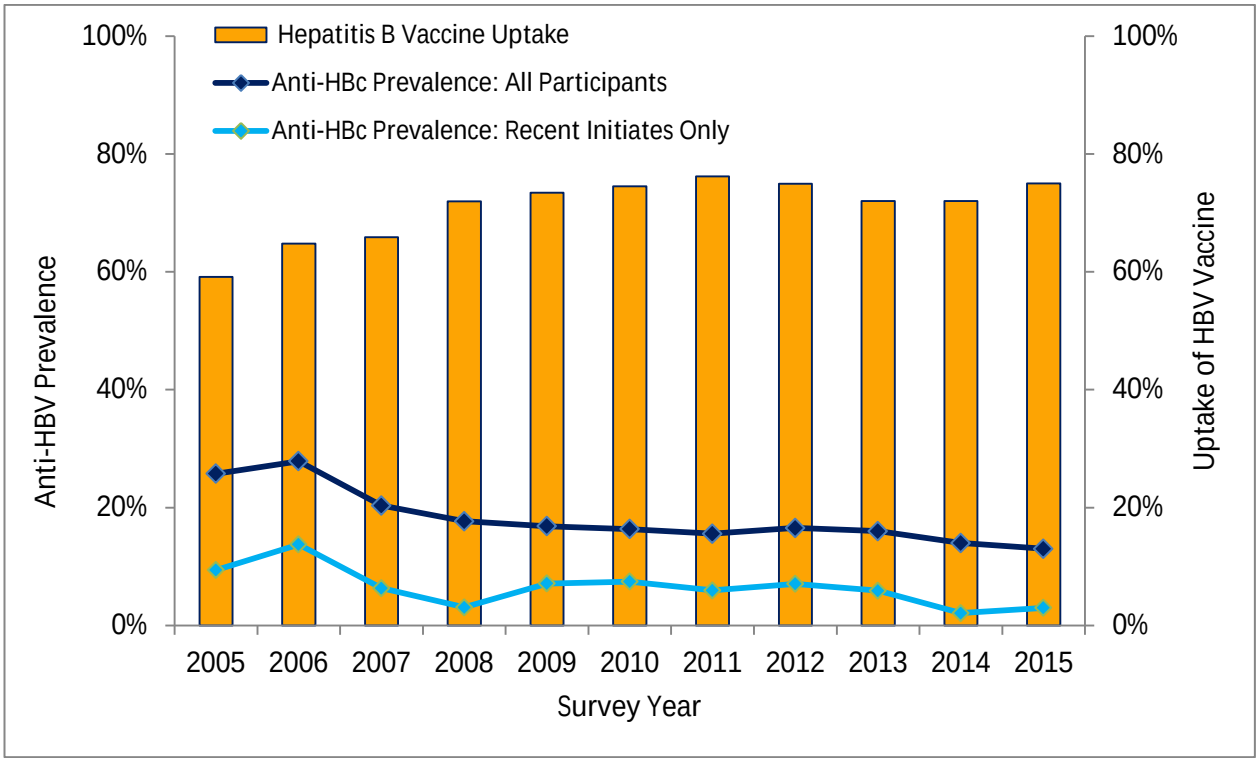
The prevalence of anti-HBc among the recent initiates to injecting drug use taking part in the survey across England, Wales and Northern Ireland was 3.5% (95% CI, 1.7%-6.9%) in 2015. Prevalence in this group had fluctuated between 2.1% and 14% between 2005 and 2015, with the prevalence in 2015 significantly lower than that in 2005 (9.4%, 95% CI, 4.9%-10%; see figure 2; table 26 of the dataset; and statistical note e).

Figure 1. Prevalence of anti-HIV and uptake of voluntary confidential testing (VCT) for HIV among participants in the Unlinked Anonymous Monitoring Survey of PWID: England, Wales and Northern Ireland: 2005-2015



Note: A recent initiate is someone who first injected during the preceding three years.

Figure 2. Prevalence of anti-HBc and uptake of the vaccine against hepatitis B among participants in the Unlinked Anonymous Monitoring Survey of PWID: England, Wales and Northern Ireland: 2005-2015



Note: A recent initiate is someone who first injected during the preceding three years.

The samples that had anti-HBc detected were also tested for hepatitis B surface antigen (HBsAg), a marker of current infection. In 2015, 3.1% (11/350, 95% CI, 1.7%-5.6%) of samples with anti-HBc had HBsAg detected. This represents 0.41% (11/2,714, 95% CI, 0.22%-0.73%) of all the PWID surveyed in England, Wales and Northern Ireland in 2015.

The survey also monitors, through self-reports, the uptake of hepatitis B vaccine. Vaccine uptake among the survey participants has fluctuated between 59% and 76% during the period from 2005 to 2015. It was 75% (95% CI, 74%-77%) in 2015, and similar to the 72% in the previous two years (2014: 95% CI, 71%-74%) (table 6 of the dataset; and statistical note f).

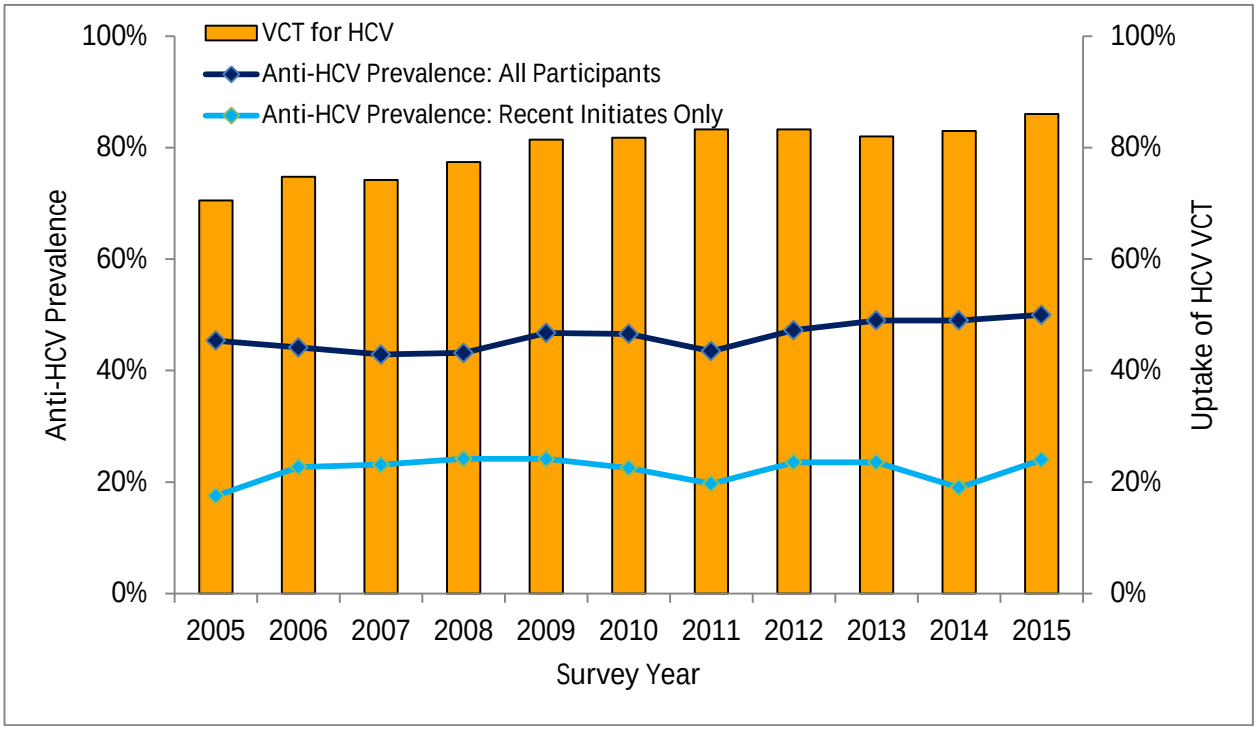
Hepatitis C among people injecting psychoactive drugs

The prevalence of antibodies to the hepatitis C virus (anti-HCV) among the survey participants across England, Wales and Northern Ireland was 50% (95% CI, 49%-52%) in 2015. This is significantly higher than the anti-HCV prevalence of 45% (95% CI, 44%-47%) seen in 2005, but similar to the prevalence in 2013 and 2014 (see figure 3; table 3 of the dataset; and statistical note g). However, the level seen during the last decade, though a little higher than at the end of the 1990s, is much lower than those found in the early 1990s when prevalence was over 60%[4]. By country, anti-HCV prevalence in 2015 was as follows: Northern Ireland, 27% (95% CI, 21%-35%; see table 25 of the dataset); Wales, 53% (95% CI, 47%-59%; see table 24 of the dataset); and England, 52% (95% CI, 50%-54%; see table 11 of the dataset). The anti-HCV prevalence in England and Northern Ireland has not changed significantly over the last decade (see tables 11 and 25 of the dataset; and statistical notes h and i). In Wales, although the anti-HCV prevalence in 2015 was significantly higher than it was a decade ago, it had not changed greatly in recent years (see table 24 of the dataset; and statistical note j).

The prevalence of anti-HCV among the recent initiates taking part in the survey across England, Wales and Northern Ireland was 24% (95% CI, 19%-30%) in 2015. This is a similar level to that seen in this group in recent years, but higher than the prevalence in 2005 of 18% (95% CI, 14%-22%) (see figure 3; table 26 of the dataset; and statistical note k).

There has been a significant increase over the past decade in the self-reported uptake of VCT for hepatitis C among the survey participants, with the proportion of survey participants ever tested rising from 71% (95% CI, 69%-72%) in 2005 to 86% (95% CI, 84%-87%) in 2015 (see figure 3; table 8 of the dataset; and statistical note l). The proportion of the participants with anti-HCV, who answered the questions on the uptake of VCT for hepatitis C, reporting that they were aware of their hepatitis C infection was 52% (95% CI, 49%-55%) in 2015 (see table 8 of the dataset). This indicates that around half of the hepatitis C infections in this population remain undiagnosed.

Figure 3. Prevalence of anti-HCV and uptake of voluntary confidential testing (VCT) for hepatitis C among participants in the Unlinked Anonymous Monitoring Survey of PWID: England, Wales and Northern Ireland: 2005-2015



Note: A recent initiates is someone who first injected during the preceding three years.

Symptoms of an infection at an injection site among people injecting psychoactive drugs

Symptoms of a possible injecting-site infection are common among PWID across England, Wales and Northern Ireland. In 2015, 33% (95% CI, 30%-35%) of PWID who had injected during the preceding year reported that they had experienced an abscess, sore or open wound at an injection site – all possible symptoms of an injecting-site infection - during the preceding year (see table 9 of the dataset). This is a similar level to 35% (95% CI, 33%-37%) in 2006, the first year this question was included in the survey.

Behavioural factors among people injecting psychoactive drugs

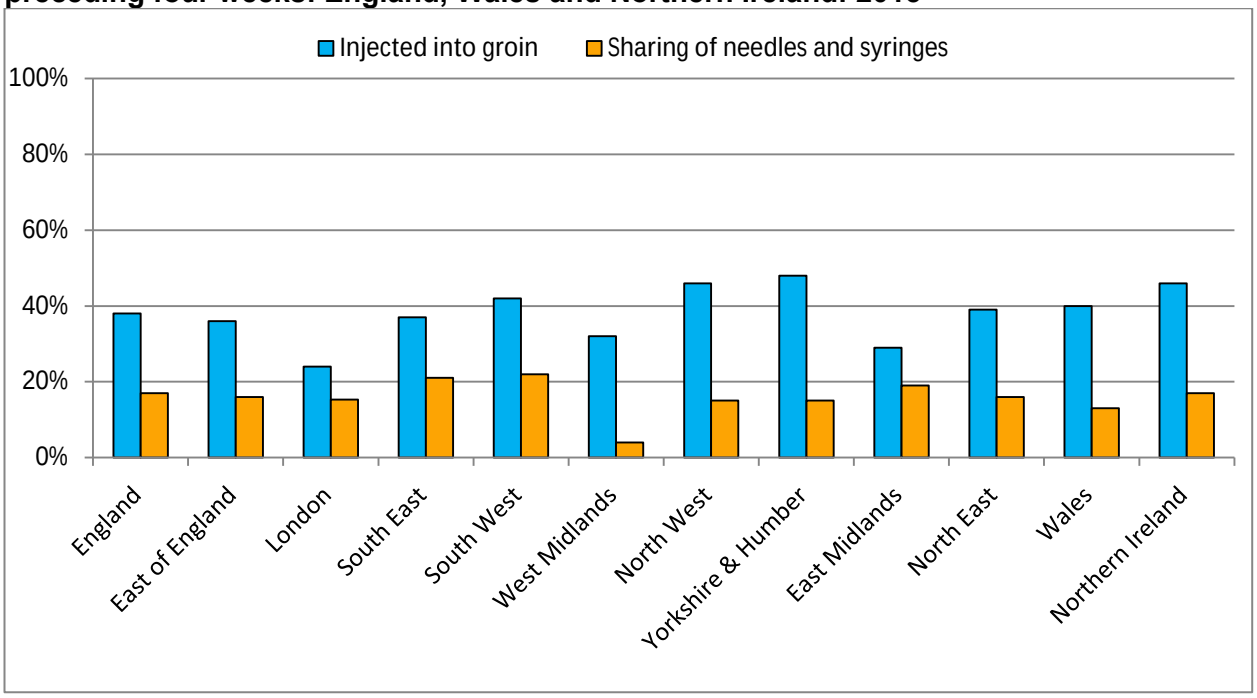
The level of needle and syringe (direct) sharing reported by participants in the survey from across England, Wales and Northern Ireland who had injected during the preceding four weeks has declined, with sharing falling from 28% (95% CI, 26%-30%) in 2005 to 16% (95% CI, 14%-18%) in 2015 (see table 4 of the dataset; and statistical note m). Direct sharing was found to vary across England, Wales and Northern Ireland, ranging in 2015 from 4.0% (95% CI, 0.90%-12%) in the West Midlands to 22% (95% CI, 16%-30%) in the South West (figure 4; and see tables 11 to 25 of the dataset). Throughout the period 2005 to 2015 direct sharing levels were consistently higher among those aged under 25 years than among older participants; in 2015, 25% (95% CI, 16%-36%) of those aged under 25 years reported direct sharing compared with

21% (95% CI, 18%-25%) of those aged 25 to 34 years and 13% (95% CI, 11%-15%) of those aged 35 years and over (see table 4 of the dataset). During this period direct sharing levels were consistently higher among female than male participants; in 2015, 23% (95% CI, 19%-28%) of females reported direct sharing compared with14% (95% CI, 12%-16%) of males.

The proportion of current PWID who reported injecting into their groin during the preceding four weeks varied across England, Wales and Northern Ireland (figure 4; and see tables 11 to 25 of the dataset). By country, the proportion injecting into the groin in 2015 was as follows: England 38% (95% CI, 35%-40%); Wales, 40% (95% CI, 33%-47%); and Northern Ireland 46% (95% CI, 31%-62%). Across England, there are differences in the proportion reporting injecting into their groin, ranging from 24% (95% CI, 18%-33%) in London to 48% in Yorkshire & Humber (95% CI, 39%-57%).

In 2015, two-thirds (66%, 95% CI, 65%-68%) of the participants reported having anal or vaginal sex during the preceding year, and this level has changed little over time (see table 10 of the dataset). Of those who had sex in the preceding year, 40% (95% CI, 38%-43%) reported in 2015 having had two or more sexual partners during that time and, of these, only 22% (95% CI, 18%-25%) reported always using condoms for anal or vaginal sex (see table 10 of the dataset).

Figure 4. Levels of needle and syringe sharing and injection into the groin among the participants in the Unlinked Anonymous Monitoring Survey of PWID who had injected during the preceding four weeks: England, Wales and Northern Ireland: 2015



Infections and risks among people who inject image and performance enhancing drugs

In 2012, following a pilot study during 2010-11 [6], a biennial sub-survey of people who inject image and performance enhancing drugs was established. This sub-survey has an 18 month recruitment period and uses a modified questionnaire focused on the use and injection of image and performance enhancing drugs, the questionnaire used in the main Unlinked Anonymous Monitoring Survey of PWID is focused on psychoactive drug use. The new data published is from the second sampling wave of this sub-survey which occurred during 2014-2015.

There were 354 participations in the sub-survey during 2014-15 from across England and Wales, of these, 0.56% (95% CI, 0.02%-2.2%) had HIV, 2.5% (95% CI, 1.3%-4.8%) anti-HBc and 5.1% (95% CI, 3.2%-7.9%) anti-HCV (see tables IPED-1, IPED-2, & IPED-3 of the dataset). These prevalences are not significantly different from those found in the 2012-13 sampling wave (statistical note n). Though the prevalence of antibodies to both hepatitis B and C were lower than among those found among the participants in the main survey targeted at people who inject psychoactive drugs, the prevalence of HIV is similar in both of the surveys.

Among the participants in the 2014-15 sub-survey of people who inject image and performance enhancing drugs, 38% (95% CI, 33%-43%) reported uptake of the hepatitis B vaccine, 47% (95% CI, 42%-52%) reported ever having a VCT for HIV, and only 41% (95% CI, 36%-47%) reported a VCT for hepatitis C (see tables IPED-5, IPED-6, & IPED-7 of the dataset). Whilst the uptake of VCT for hepatitis C has increased since the 2012-2013 survey wave, there has been no significant change in the uptake of VCT for HIV or of hepatitis B vaccination (statistical note o). The levels of the uptake of these three interventions reported by people who inject image and performance enhancing drugs surveyed are much lower than those reported among the participants in the main survey of people who inject psychoactive drugs.

The reported sharing of injecting equipment has remained low, with only 13% (95% CI, 9.9%-17%) reporting that they had *ever* shared a needle, syringe or vial in 2014-2015 (see table IPED-4 of the dataset). This population is sexually active, with over nine-tenths (92%, 95% CI, 89%-95%) of the participants reported having had anal or vaginal sex during the preceding year. Of those who had sex during the preceding year, 51% (95% CI, 46%-57%) reported having had two or more sexual partners during that time and, of these, only 17% (95% CI, 12%-25%) reported always using condoms for anal or vaginal sex (see table IPED-9 of the dataset).

Conclusion

In conclusion, data from the main Unlinked Anonymous Monitoring Survey of PWID, which is targeted at people who inject psychoactive drugs, indicate that the proportion ever infected with hepatitis B has declined and that the prevalence of both HIV and hepatitis C among this group is currently stable. The level of hepatitis C infection among the recent initiates to injecting participating in this survey suggest that the extent of their transmission has probably changed little in recent years. Overall, reported needle and syringe sharing has declined over the last decade, however, sharing remains high among younger PWID, with a quarter of those aged under 25 years reporting sharing in 2015. Three-quarters of the survey participants reported uptake of the hepatitis B vaccine, and the vast majority of those with HIV were aware of their status. However, half of PWID with antibodies to hepatitis C remain unaware of their infection, even though four-fifths reported having been tested for hepatitis C infection. After increasing during the previous decade, the uptake of testing for hepatitis C infection and of the hepatitis B vaccine have both changed little over the last few years.

Data from the sub-survey of people who inject image and performance enhancing drugs indicate that while hepatitis B and C are less common in this group, the HIV prevalence is similar to that among those participating in the main Unlinked Anonymous Monitoring Survey of people who inject psychoactive drugs. The uptake of interventions, such as hepatitis B vaccination and HIV testing, among people who inject image and performance enhancing drugs remains poor.

Together, these findings indicate that unsafe injecting continues to be a problem and that there is a need to maintain and strengthen public health interventions that aim to reduce injection related risk behaviours. The impact of public health interventions which aim to prevent HIV and hepatitis C infection through injecting drug use by reducing these risks, such as needle and syringe programmes [7] and opiate substitution therapy [8], have been shown to be dependent on their coverage [9-12]. The provision of interventions that aim to reduce infections among PWID should be regularly reviewed to ensure that the coverage of these is appropriate to local need.

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Statistical notes

a) After adjusting for age, gender and region of recruitment (London vs. elsewhere) in a multi-variable analysis, the odds ratio for 2015 was 0.71 [95% CI, 0.42-1.2] compared to 1.0 in 2005; indicating no significant change in the HIV prevalence in England over time.

b) After adjusting for age, gender, and region of recruitment (London vs. elsewhere) in a multi-variable analysis, the HIV prevalence among the recent initiates fluctuated between 2005 and

2015, with an odds ratio of 1.7 [95% CI, 0.51-5.9] in 2015 compared to 1.0 in 2005; indicating no significant change in prevalence overtime.

c) After adjusting for age, gender and region of recruitment in a multi-variable analysis, the odds ratio for 2015 was 1.9 [95% CI, 1.6-2.1] compared to 1.0 in 2005; indicating a significant increase in the uptake of VCT for HIV over time.

d) After adjusting for age, gender, and region of recruitment in a multi-variable analysis the anti-HBc prevalence in 2015 was significantly different from that in 2005; the odds ratio in 2015 was 0.41 [95% CI, 0.35-0.48] compared to 1.0 in 2005; indicating a significant decrease. Prevalence was significantly lower than in 2005 from 2007 onwards.

e) After adjusting for age, gender and region of recruitment in a multi-variable analysis, the anti-HBc prevalence among recent initiates has varied over time. The odds ratio for 2015 was 0.38 [95% CI, 0.16-0.89] lower than odds ratio of 1.0 in 2005. Prevalence was also significantly lower in 2008 and 2014.

f) After adjusting for age, gender and region of recruitment in a multi-variable analysis, the odds ratio for 2015 was 2.4 [95% CI, 2.1-2.7] compared to 1.0 in 2005; indicating a significant increase in hepatitis B vaccine uptake over time.

g) After adjusting for age, gender and region of recruitment in a multi-variable analysis, the odds ratio in 2015 of 1.2 [95% CI, 1.05-1.3] was significantly different from the odds ratio of 1.0 in 2005; indicating a significant change in hepatitis C prevalence between these two years. Prevalence was also significantly higher than 2005 in 2009, 2013 and 2014.

h) After adjusting for age, gender and region of recruitment in England in a multi-variable analysis, the odds ratio in 2015 of 1.1 [95% CI, 0.96-1.2] was not significantly different from the odds ratio of 1.0 in 2005; indicating no significant difference in the hepatitis C prevalence in England between these years. The prevalence in 2009 and 2013 was significantly higher than in 2005, and that in 2008 was significantly lower.

i). After adjusting for age, gender and area of recruitment in Northern Ireland in a multi-variable analysis, the odds ratio in 2015 of 0.73 [95% CI, 0.39-1.4] was not significantly different from the odds ratio of 1.0 in 2005; indicating no significant change in hepatitis C prevalence in Northern Ireland.

j) After adjusting for age, gender and area of recruitment in Wales in a multi-variable analysis, the odds ratio in 2015 of 3.6 [95% CI, 2.3-5.7] was significantly different from the odds ratio of 1.0 in 2003-2005; indicating a significant change in hepatitis C prevalence in Wales over time. The prevalence in 2008, 2011, 2013 and 2014 was significantly higher than in 2005.

k) After adjusting for age, gender, and region of recruitment in a multi-variable analysis the odds ratio for 2015 was 1.6 [95% CI, 1.01-2.4] which was significantly different from the odds ratio of 1.0 in 2005; indicating an increase in the hepatitis C prevalence among the recent initiates between these years. The prevalence in the group was also significantly higher than 2005 in all years other than 2010, 2011, and 2014.

l) After adjusting for age, gender and region of recruitment in a multi-variable analysis, the odds ratio for 2015 was 2.4 [95% CI, 2.1-2.7] compared to 1.0 in 2005 indicating a significant increase in uptake of VCT for hepatitis C over time.

m) After adjusting for age, gender, and region of recruitment in a multi-variable analysis the level of direct sharing in 2015 was significantly different from 2005; the odds ratio in 2015 was 0.62 [95% CI, 0.52-0.75] compared to 1.0 in 2005 indicating a significant decrease over time.

n) Comparing data from 2012-13 survey wave with that for 2014-15 using the chi-squared test (Fischer exact): for HIV p=0.131, for anti-HBc p=1.000, and for anti-HCV p=0.430.

o) Comparing data from 2012-13 survey wave with that for 2014-15 using the chi-squared test (Fischer exact): VCT for HIV p=0.155, VCT for HCV p=0.016, and hepatitis B vaccine uptake p= 0.669.

Infection report

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Bacteraemia

Surveillance of *Enterococcus* spp. causing bacteraemia in England, Wales and Northern Ireland: 2015

These analyses are based on data extracted from the voluntary surveillance databases, SGSS (Second Generation Surveillance System; for cases within England), CoSurv (for cases within Northern Ireland) and Datastore (for cases within Wales). Data were extracted on 8 March 2016 for England, 17 May 2016 for Northern Ireland and 10 April 2015 for Wales. The data presented here may differ in some instances from data in earlier publications due to inclusion of late reports.

Rates were calculated using 2014 mid-year resident population estimates based on the 2011 census for England, Wales, and Northern Ireland [1]. Rates of bacteraemia in infants were calculated using 2014 live birth denominators [2]. Geographical analyses were based on the residential location of the patient with cases in England being assigned to 15 local region catchments formed from administrative local authority boundaries (formerly PHE Centres).

This report includes analyses of the trends, patient demographic and geographical distribution, antimicrobial susceptibility among the isolates from enterococcal bacteraemia episodes as well asdetails of relevant recent antimicobial resistance alerts and microbiological services guidance concerning enterococcal isolates.

Key Points

- The overall incidence rate of *Enterococcus* spp. bacteraemia in England, Wales and Northern Ireland was 11.2 per 100,000 population in 2015
- in 2015, the *Enterococcus* spp. bacteraemia rates in England, Northern Ireland and Wales were 10.9, 13.6 and 14.8 per 100,000 population, respectively
- between 2014 and 2015, the rates of bacteraemia caused by *Enterococcus* spp. increased by 8.4% in England, 3.1% in Northern Ireland and 3.3% in Wales
- within England, the Devon, Cornwall & Somerset area reported the highest rate (15.1/100,000) of *Enterococcus* spp. bacteraemia and Thames Valley the lowest (7.8) in 2015; all areas reported an increase between 2011 and 2015 with the exception of Anglia & Essex
- in England, 82% of enterococcal bacteraemia isolates were reported to species level in 2015, an increase from the 77% identified to species level in 2011
- the two most frequently isolated species within the genus in 2015 were *Enterococcus faecalis*, and *Enterococcus faecium*, representing 41% and 37% of reported enterococcal bacteraemia respectively; the primacy of each varied by Country
- the incidence rate of *Enterococcus* spp. bacteraemia was highest among the elderly (≥75 years; 47.4/100,000) and infants (<1 year old; 35.7) and higher among males than females in 2015 in England
- a differing age distribution was noted between the two most frequently identified enterococcal bacteraemia species in England; there was a relatively low rate of *E. faecium* bacteraemia in infants (aged <1 year) compared with *E. faecalis* bacteraemia (3.0 compared with 27.7/100,000)
- half of infant enterococcal bacteraemias occurred in the first four weeks of life, with 86% caused by *E. faecalis*
- in 2015 the proportion of *E. faecalis* and *E. faecium* bacteraemia isolates in England with antimicrobial susceptibility test results reported for at least one key antimicrobial was 88%
- among *E. faecalis* and *E. faecium* isolates in England, the proportions resistant to vancomycin in 2015 were 1.5% and 23.9% respectively

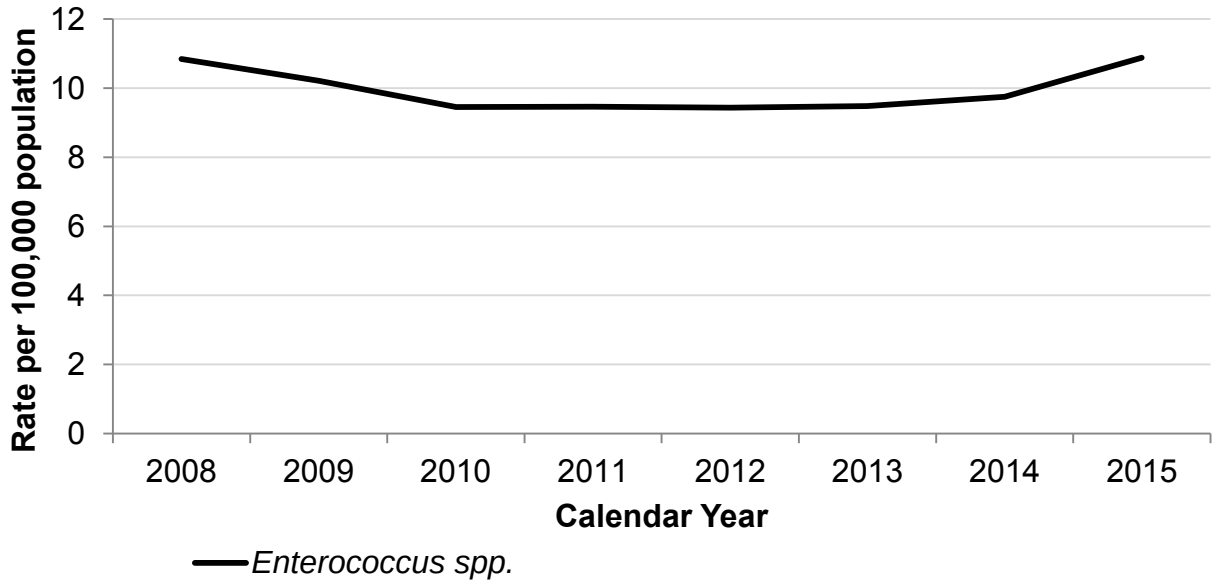
Trends

Between 2008 and 2015 there was no overall change in incidence rate of bacteraemia caused by *Enterococcus* spp., remaining around 10.8 per 100,000 (figure 1). However, the incidence rate by year has not remained steady, with a decrease in the incidence rate seen between 2008 and 2010, followed by a relatively stable period (around ~9.5/100,000) until 2014. Between 2014 and 2015 an increase of 8.4% in the rate of enterococcal bacteraemia infection was reported (9.8/100,000 to 10.9 respectively).

A note of caution should be taken when interpreting these results. At the end of 2014 the system of laboratory reporting to PHE changed; this may partly explain the increase in *Enterococcus* spp. bacteraemia reports observed in 2015 due to improved accessibility to reporting within England.

Enterococcus spp. were the seventh most commonly identified organism in reported mono-microbial bloodstream infection in 2014, comprising 4.2% of such infections), and the third most common organism in poly-microbial bloodstream infections (22.3% of such infections) [3].

Figure 1. *Enterococcus* spp. bacteraemia per 100,000 population (England); 2008 to 2015

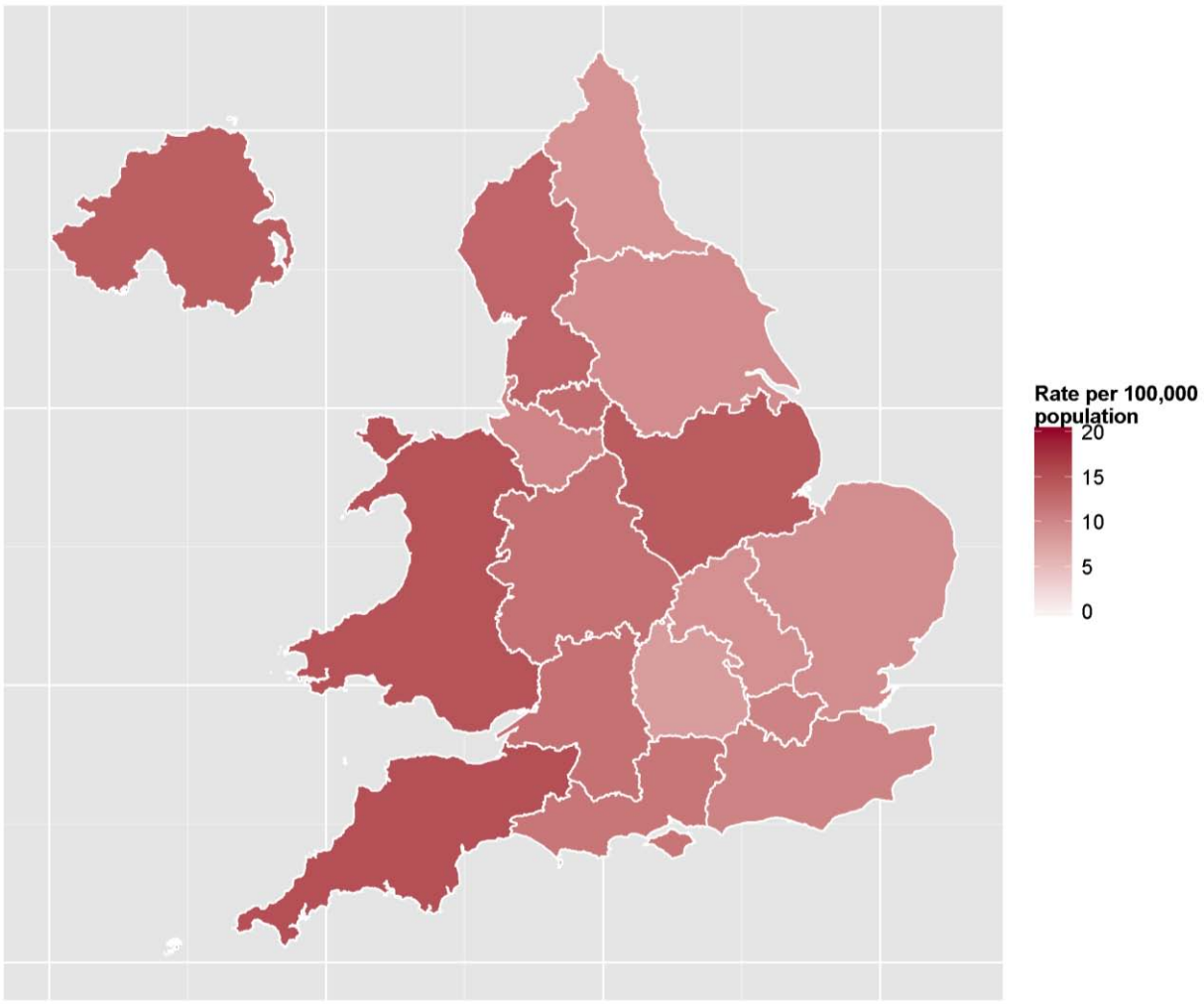


In line with this series of reports, all analyses presented hereafter, focus on the most recent five years (2011-2015), or latest year of data.

Geographic distribution

The overall rate of *Enterococcus* spp. bacteraemia in England, Wales and Northern Ireland in 2015 was 10.9, 13.6 and 14.8 per 100,000 population per year respectively (figure 2).

Figure 2. Geographical distribution of *Enterococcus* spp. bacteraemia per 100,000 population (England, Wales and Northern Ireland); 2015



Across the five year period, 2011-2015, the reported *Enterococcus* spp. bacteraemia rates increased by 15% in England (9.5 to 10.9/100,000; table 1), 11% in Northern Ireland (12.2 to 13.6), and a 2% increase reported in Wales (14.6 to 14.8).

Within England, incidence rates of *Enterococcus* spp. bacteraemia varied greatly in 2015, from 7.8 per 100,000 population in the Thames Valley region to 15.1/100,000 in the Devon, Cornwall & Somerset region (table 1).

All local regions in England reported an increase in rates of *Enterococcus* spp. bacteraemia between 2011 and 2015, with the exception of the Anglia & Essex region where a 9% decrease was noted. No single region in England has continuously reported the highest (or lowest) rates.

Table 1. *Enterococcus* spp. bacteraemia per 100,000 population by region (England, Wales and Northern Ireland): 2011 to 2015

		Rate per 100,000 population				
Region	**Local Region**	**2011**	**2012**	**2013**	**2014**	**2015**
London	London	10.1	10.2	9.8	10.3	10.3
Midlands and East of England	South Midlands & Hertfordshire	6.9	5.6	6.9	7.8	9.1
	East Midlands	12.0	11.1	11.0	10.6	14.0
	Anglia & Essex	10.3	10.4	8.7	9.7	9.3
	West Midlands	10.1	9.8	11.8	12.1	12.2
North of England	Cheshire & Merseyside	9.8	10.7	11.9	10.8	10.0
	Cumbria & Lancashire	8.6	9.0	9.5	11.3	13.0
	Greater Manchester	11.9	13.1	13.0	12.5	12.3
	North East	8.4	6.5	8.6	8.0	8.7
	Yorkshire & Humber	8.4	7.5	6.4	6.7	9.4
South of England	Avon, Gloucestershire & Wiltshire	7.3	9.6	9.1	9.8	11.9
	Devon, Cornwall & Somerset	10.2	11.3	10.4	10.8	15.1
	Wessex	9.6	9.8	10.9	10.6	11.6
	Kent, Surrey & Sussex	9.1	9.4	9.0	8.5	10.3
	Thames Valley	6.0	5.7	4.6	6.3	7.8
England		**9.5**	**9.4**	**9.5**	**9.8**	**10.9**
Northern Ireland		**12.2**	**13.2**	**14.2**	**13.2**	**13.6**
Wales		**14.6**	**14.9**	**15.9**	**14.3**	**14.8**
England, Wales & Northern Ireland		**9.8**	**9.8**	**10.0**	**10.1**	**11.2**

Species distribution

The number of *Enterococcus* spp. bacteraemia reports, between 2011 and 2015, in England, Northern Ireland and Wales increased by 19%, 14% and 2% respectively (table 2). Comparably, in England, the total number of bacteraemia (any genus) reported to SGSS increased by 30% between 2011 and 2015 (92,905 to 121,220 reports)[1].

In 2015, 83% of *Enterococcus* spp. bacteraemia reports were identified to species level in England, Wales and Northern Ireland, a 25% increase on the 78% reported to species level in 2011. There was variation by country with 82%, 94% and 98% *Enterococcus* spp. bacteraemia reports identified to species level in England, Wales and Northern Ireland in 2015 respectively (table 2).

In 2015, 41% of *Enterococcus* spp. bacteraemia reports were identified as *E. faecalis* in England (2412/5910), 50% in Wales (228/457) and 42% in Northern Ireland (105/251). *E. faecium* was the second most frequently identified *Enterococcus* spp. in England and Wales (36% and 41% respectively), but the most frequently identified species in Northern Ireland (52%; 130/251).

Over the past five years, the proportion of *Enterococcus* spp. bacteraemia caused by *E. faecium* has increased from 29% in 2011 to 37% in 2015, reflecting a 48% increase in the number of reports (1657 to 2445 reports respectively). This increase is greater than that of the improvement in the proportion of isolates undergoing speciation, suggesting that there is an increasing dominance of *E. faecium* compared with other enterococci.

Of the other enterococcal bacteraemia species, only in *E. raffinosus* reports had a greater observed percentage increase compared with *E. faecium*, with the number of reports increasing by 185% from 13 in 2011 to 37 in 2015 in England; however, the number of actual reports in bacteraemia remained low. Of note, there was a sustained decrease in the number of *E. gallinarum* bacteraemia reports in England, from 125 in 2011 to 83 in 2015 (a decrease of 34%).

The changes in distribution of less common species of *Enterococcus* may in part be due to the increasing use of MALDI-ToF analysis in hospitals, which allows for better species identification and also a greater reporting of minor species not previously recognised in most clinical laboratories.

[1]The number of reported blood cultures positive for distinct bacterial genera

Table 2. Reports of *Enterococcus* spp. bacteraemia by species (England, Wales and Northern Ireland); 2011 to 2015

	2011		2012		2013		2014		2015	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
England										
E. avium	52	1	49	1	45	1	46	1	60	1
E. casseliflavus	30	1	32	1	38	1	51	1	49	1
E. durans	26	1	23	0	18	0	19	0	19	0
E. faecalis	2068	41	2069	41	2084	41	2129	41	2412	41
E. faecium	1446	29	1684	34	1759	35	1922	37	2128	36
E. gallinarum	125	3	120	2	106	2	84	2	83	1
E. hirae	3	0	4	0	0	0	4	0	4	0
E. raffinosus	13	0	19	0	33	1	27	1	37	1
Enterococcus spp., other named	81	2	60	1	39	1	54	1	36	1
Enterococcus spp., sp. not recorded	1140	23	953	19	953	19	916	17	1082	18
***Enterococcus* spp.**	**4984**	100	**5013**	100	**5075**	100	**5252**	100	**5910**	100
Wales										
E. avium	0	0	0	0	4	1	6	1	4	1
E. casseliflavus	0	0	2	0	3	1	4	1	2	0
E. durans	0	0	1	0	1	0	1	0	0	0
E. faecalis	226	51	220	48	216	44	210	48	228	50
E. faecium	102	23	155	34	205	42	179	41	187	41
E. gallinarum	1	0	2	0	2	0	0	0	2	0
E. hirae	1	0	0	0	1	0	1	0	1	0
E. raffinosus	1	0	3	1	4	1	4	1	7	2
Enterococcus spp., other named	0	0	0	0	0	0	0	0	0	0

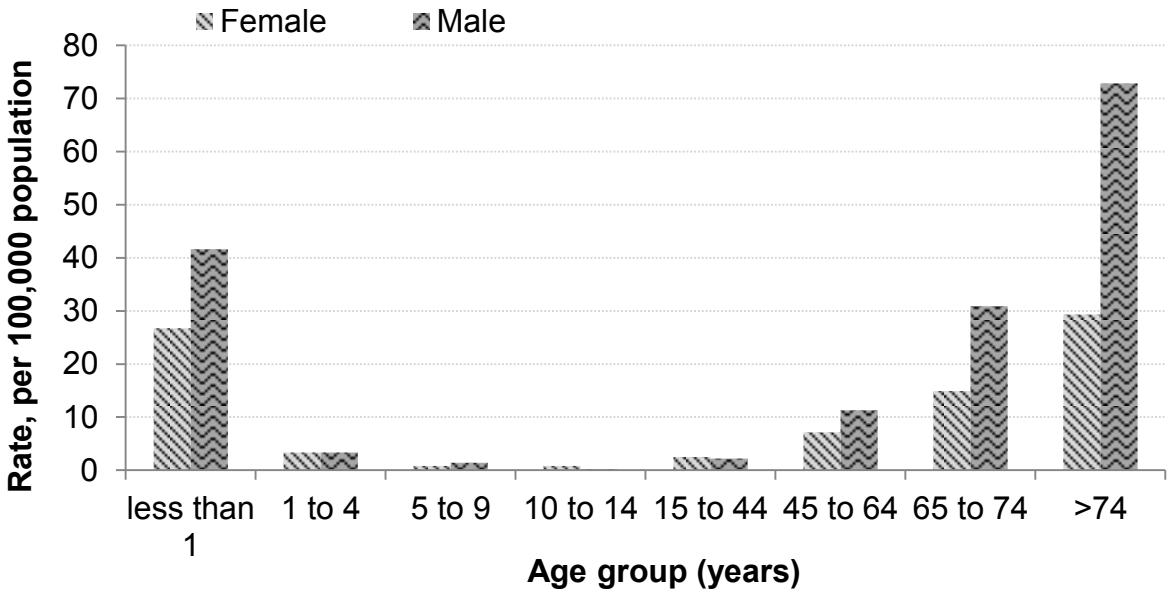
	Enterococcus spp., sp. not recorded	113	25	72	16	54	11	36	8	26	6
	***Enterococcus* spp.**	**444**	**100**	**455**	**100**	**490**	**100**	**441**	**100**	**457**	**100**
Northern Ireland											
	E. avium	2	1	6	3	1	0	2	1	1	0
	E. casseliflavus	6	3	0	0	2	1	1	0	2	1
	E. durans	1	0	1	0	3	1	0	0	1	0
	E. faecalis	95	43	107	45	123	47	99	41	105	42
	E. faecium	109	49	117	49	118	46	132	55	130	52
	E. gallinarum	3	1	6	3	3	1	2	1	3	1
	E. hirae	0	0	0	0	0	0	0	0	0	0
	E. raffinosus	0	0	1	0	5	2	4	2	5	2
	Enterococcus spp., other named	0	0	0	0	0	0	0	0	0	0
	Enterococcus spp., sp. not recorded	5	2	2	1	4	2	2	1	4	2
	***Enterococcus* spp.**	**221**	**100**	**240**	**100**	**259**	**100**	**242**	**100**	**251**	**100**

Age and Sex distribution

In line with previous reports, the highest rates of *Enterococcus* spp. bacteraemia in England in 2015 were observed in those aged 75 years or older (47.4 /100,000 population) and those aged less than one year (35.7/100,000) [4].

Variation in rates were also observed by gender, with higher rates noted in men for the majority of age groups in 2015, the exceptions being for those aged between 10 and 44 years (figure 3a). The most striking differences were noted in those aged 75 years and over (males: 72.8; females: 29.3) and to a lesser extent in those aged between 65 and 74 years (males: 30.9; females: 14.9).

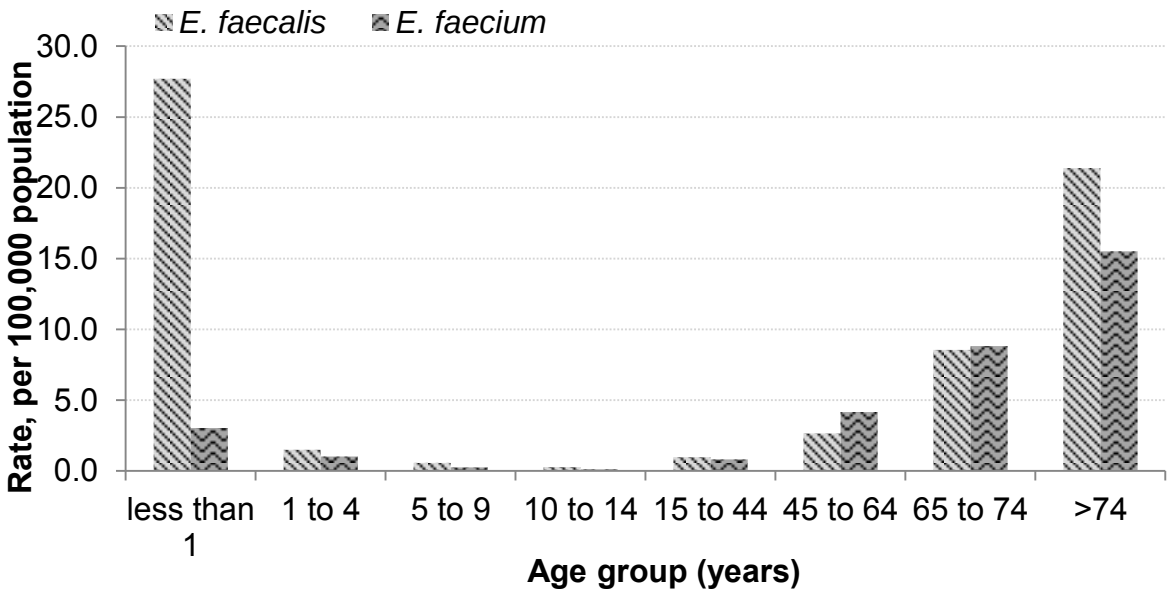
Figure 3a. *Enterococcus* spp. bacteraemia rates per 100,000 population by age and sex (England); 2015



Of the Enterococcal bacteraemia reported in infants less than 1 year, 78% are identified as *E. faecalis* (205/263) and 8% as *E. faecium* (22/263). The relative age distribution between the two most frequently reported *Enterococcus* spp. bacteraemia species, *E. faecalis* and *E. faecium*, differed in 2015 in England. Reviewed by species the rate of infection in infants less than 1 year was the highest incidence of *E. faecalis* (27.7/100,000 population), followed by those aged 75 years and over (21.4/100,000; figure 3b), differing from bacteraemia caused by *E. faecium* which was much less likely to be in infants (3.0/100,000).

The rate of *Enterococcus* spp. bacteraemia in neonates (<29 days old) in England was 0.20/1000 live births in 2015. Neonatal reports accounted for 50% of Enterococcal bacteraemia in infants (<1 year; 131/263), and 86% of those were reported as *E. faecalis* (113/131). Neonatal incidence of *E. faecalis* (<29 days) was 0.17/1000 live births, with early onset disease (<3 days old) occurring less often than late onset disease (3-28 days old) in 2015 (0.04 compared with 0.13/1000 live births).

Figure 3b. Age and sex population rate per 100,000 population for *E. faecalis* and *E. faecium* bacteraemia (England); 2015



Antimicrobial Resistance

Antimicrobial resistance of *Enterococcus* spp. to a glycopeptide (vancomycin/teicoplanin) has been identified by the Department of Health expert advisory committee for antimicrobial resistance and healthcare associated infections (ARHAI) as a key drug-bug combination and features in the English Surveillance Programme for Antimicrobial Utilisation and Resistance (ESPAUR) annual report [5][6].

The proportion of isolates showing vancomycin resistance among all *Enterococcus* spp. from bacteraemia in England increased each year from 10% in 2011 to 17% in 2015.

Focussing on the most commonly reported enterococci causing bacteraemia, (*E. faecalis* and *E. faecium*), the proportion of isolates for which antimicrobial susceptibility test results were reported for at least one of ampicillin/amoxicillin, vancomycin, teicoplanin or linezolid, was 88% in 2015 (2133/2412 and 1870/2128 respectively; tables 3a and 3b). A 2016 UK public health resistance alert has recommended that laboratories perform linezolid

susceptibility tests on all *Enterococcus* spp. isolates from blood (and other sterile sites); the level of test reporting in 2015 was 61%, and represents a 28% increase in linezolid susceptibility test reporting from 2011, when only 47% enterococcal bacteraemia episodes had a linezolid result reported.

Reported resistance among *E. faecalis* isolates was low in 2015, comprising ≤2% for each of ampicillin/amoxicillin, vancomycin, teicoplanin and linezolid (table 3a). The proportion of *E. faecalis* bacteraemia isolates that were resistant to each of the reported antimicrobials decreased between 2011 and 2015, most notably for reported resistance to ampicillin/amoxicillin from 4.8% in 2011 to 2.0% in 2015. The decline in reported ampicillin/amoxicillin resistance is likely to be as a result of the overall improved species identification within *Enterococcus* spp; resistance to ampicillin/amoxicillin is not expected in *E. faecalis* isolates and this fact is commonly used as a distinguishing characteristic to differentiate between *E. faecalis* and *E. faecium* species.

The proportion of isolates of *E. faecium* resistant to each antibiotic was higher than the corresponding proportion seen with *E. faecalis* In 2015 the proportion of susceptibility tested *E. faecium* bacteraemia specimens resistant to ampicillin/amoxicillin was 92% (1673/1817), vancomycin 24% (423/1770), teicoplanin 25% (368/1452) and linezolid 1% (18/1374; table 3b).

Resistance to ampicillin/amoxicillin and linezolid identified in *E. faecium* specimens has remained stable over the 5 year period (2011 to 2015), with only slight fluctuations observed. However, a steady increase in the proportion of *E. faecium* bacteraemia isolates resistant to glycopeptides over the same period was reported. In 2015, the proportion of *E. faecium* isolates resistant to glycopeptides (vancomycin or teicoplanin) was 27%.

The most prevalent glycopeptide resistance genes (*vanA* and *vanB*) confer resistance to vancomycin and teicoplanin (v*anA*) or to vancomycin without resistance to teicoplanin (v*anB*). The apparent higher proportion of isolates resistant to teicoplanin (table 3b) may reflect differential local testing and reporting preferences for one or other glycopeptide.

Table 3a. Antimicrobial susceptibility for *E. faecalis* bacteraemia (England); 2011 to 2015**

	2011		2012		2013		2014		2015	
	No. Tested	% Resistant*	No. Tested	% Resistant	No. Tested	% Resistant	No. Tested	% Resistant	No. Tested	% Resistant
Ampicillin/Amoxicillin	1805	5	1847	4	1844	3	1758	3	1986	2
Vancomycin	1710	3	1777	1	1761	1	1711	2	1969	1
Teicoplanin	1292	3	1365	2	1360	1	1366	2	1551	2
Linezolid	1018	<1	1123	<1	1240	<1	1201	<1	1422	<1
Total Reports	**2068**		**2069**		**2084**		**2129**		**2412**	

***** defined as reduced- or non-susceptible
** isolates can be tested against multiple drugs

Table 3b. Antimicrobial susceptibility for *E. faecium* bacteraemia (England); 2011 to 2015**

	2011		2012		2013		2014		2015	
	No. Tested	% Resistant*	No. Tested	% Resistant	No. Tested	% Resistant	No. Tested	% Resistant	No. Tested	% Resistant
Ampicillin/Amoxicillin	1279	89	1501	92	1560	92	1540	91	1710	92
Vancomycin	1269	17	1499	19	1558	23	1570	22	1770	24
Teicoplanin	1020	16	1239	19	1260	22	1278	23	1452	25
Linezolid	839	<1	1095	<1	1203	1	1191	2	1374	1
Total Reports	**1446**		**1684**		**1759**		**1922**		**2128**	

***** defined as reduced- or non-susceptible
** isolates can be tested against multiple drugs

Caution is needed in the interpretation of vancomycin resistance in all enterococci rather than by particular species. A number of enterococci have low lying intrinsic vancomycin resistance mechanism genes (*vanC;* such as *E. gallinarum* and *E. casseliflavus*), while others can acquire resistance (*vanA* or *vanB*; such as *E. faecalis* and *E. faecium*) [7].

It is important to identify enterococcal bacteraemia episodes to species level and perform all relevant antimicrobial relevant susceptibility tests; this knowledge would be especially important for infection control and the limitation of potential outbreaks, the concern being that acquired resistance is transferable between organisms [8]. Patients yielding linezolid-resistant enterococci should be isolated, as a precaution, to prevent onward transmission.

Microbiology services

In 2015, the proportion of reports of enterococcal bacteraemia in which the organism was not fully identified remained around 18%. Precise species identification of isolates would improve the monitoring of trends in emerging enterococci in particular, in addition to assisting with instigating appropriate treatment and control mechanisms locally [9].

A UK Public Health Resistance Alert was cascaded in June 2016; highlighting that potentially transferable oxadolidinone (linezolid and tedizolid) resistance mediated by the *optrA* gene has been detected in *Enterococcus faecalis* in the UK. Laboratories are recommended to screen enterococci and staphylococci from sterile sites or where oxazolidinone treatment is a viable option for resistance to linezolid. Any isolates classified as linezolid-resistant (using the EUCAST criteria[2]) should be referred to PHE's Antimicrobial Resistance and Healthcare Associated Infections Reference Unit (AMRHAI) for confirmation [10]. Welsh laboratories should refer any linezolid-resistant isolates to the Specialist Antimicrobial Chemotherapy Unit (SACU), which will confirm resistance to linezolid before referring on to PHE's AMRHAI [11].

Laboratories are requested to send any enterococcal isolates with suspected linezolid, daptomycin or tigecycline resistance, as well as isolates which show resistance to teicoplanin but not vancomycin to AMRHAI for further investigation [12].For advice on treatment of antibiotic-resistant infections due to these opportunistic pathogens laboratories should contact the Medical Microbiologists at PHE's Bacteriology Reference Department at Colindale on colindalemedmicro@phe.gov.uk.

[2] European Committee on Antimicrobial Susceptibility Testing: resistant by disc (<19 mm) or by MIC (>4mg/l)

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