Public Health England

Protecting and improving the nation's health

Quarterly epidemiological commentary

Mandatory MRSA, MSSA, Gram-negative bacteraemia and *C. difficile* infections data (up to July to September 2020)

December 2020

Contents

Data included in this quarterly epidemiological commentary

This document contains quarterly, national-level epidemiological commentaries for Methicillin-resistant *Staphylococcus aureus* (MRSA), Methicillin-sensitive *Staphylococcus aureus* (MSSA), *Escherichia coli* (*E. coli*), *Klebsiella* spp. and *Pseudomonas aeruginosa* (*P. aeruginosa*) bacteraemia and *Clostridioides difficile* infection (CDI). This includes analyses on counts and incidence rates of all cases and hospital-onset (previously referred to as trust-apportioned) cases of MRSA, MSSA, *E. coli*, *Klebsiella* spp. and *P. aeruginosa* bacteraemia and *C. difficile* infection.

All data tables associated with this report are included in an accompanying OpenDocument spreadsheet.

Revisions to data included are covered by a data-specific revisions and correction policy.

Citation to PHE, HCAI & AMR division is required. Citation: Public Health England. Quarterly epidemiology commentary: mandatory MRSA, MSSA and Gram-negative bacteraemia and *C. difficile* infection in England (up to July to September 2020) London: Public Health England, December 2020.

COVID-19 and this data

Counts of cases for the most recent quarter (July to September 2020) are generally lower than would be expected. It is clear that the global pandemic of COVID-19 is having an effect on the number of cases reported to the surveillance of blood stream infections (BSI) (particularly *E. coli*) and CDI. From an analysis of voluntary microbiology surveillance, there has also been a reduction in the number of cases of other bloodstream infections, not only those covered by the mandatory surveillance. This leads us to conclude that fewer blood cultures are being reported in general.

In response to the pandemic, elective procedures in hospitals were initially cancelled although began to resume over the summer. As a result, the denominator (bed-days) was much lower for the 2020 Q1 period than would otherwise be expected. In some instances, this has had the effect of increasing rates of infection, despite a decrease in the counts of infections. As such hospital-onset rates and incidence for 2020 Q1 need to be interpreted with caution.

It is also possible that testing for these infections and their reporting was deprioritised. If that is the case, cases may be expected to return to closer to the expected value over time. Surveillance for CDI and BSI remains mandatory, and PHE continues to expect NHS acute trusts to report all cases to the surveillance programme. Another factor to take into account, hospital-onset denominator data for Q2 2020 relies on the same quarter of the previous year as a proxy, as such this proxy number may be higher than the true value, resulting in artificially low rates of infection. It is therefore also important to consider these caveats when reading this report.

Further information

This publication forms part of the range of National Statistics outputs routinely published by Public Health England (PHE) which include monthly and annual reports on the mandatory surveillance of MRSA, MSSA and *E. coli*, *Klebsiella* spp. and *P. aeruginosa* bacteraemia and CDI.

Annual report output

Further epidemiological analyses by financial year can be found in PHE's annual epidemiological commentary.

Monthly report outputs

The following reports are produced by PHE on a monthly basis.

MRSA bacteraemia

Counts of all reported, hospital-onset cases, community-onset cases, healthcare associated and community associated MRSA bacteraemia by organisation.

MSSA bacteraemia

Counts of all reported, hospital-onset cases, community-onset cases, healthcare associated and community associated MSSA bacteraemia by organisation.

E. coli bacteraemia

Of all reported, hospital-onset cases, community-onset cases, healthcare associated and community associated *E. coli* bacteraemia by organisation.

Klebsiella spp. bacteraemia

Counts of all reported, hospital-onset cases, community-onset cases, healthcare associated and community associated *Klebsiella* spp. bacteraemia by organisation.

P. aeruginosa bacteraemia

Counts of all reported, hospital-onset cases, community-onset cases, healthcare associated and community associated *P. aeruginosa* bacteraemia by organisation.

CDI

Counts of all reported, hospital-onset cases, community-onset cases, healthcare associated and community associated CDI by organisation.

Data for this report was extracted from PHE's healthcare-associated infections data capture system (HCAI DCS) on 9 November 2020.

Epidemiological analyses of Gram-negative bacteraemia data

E. coli bacteraemia

The incidence rate of all reported *E. coli* bacteraemia increased each year between the initiation of the mandatory surveillance of *E. coli* bacteraemia in July 2011 and January to March 2020 when the COVID-19 global pandemic began (figure 1a). This was primarily driven by the increase in the rate of community-onset cases (table S1). In contrast, the incidence rate of hospital-onset cases remained relatively stable within the same period (figure 1b).

Between July to September 2011 and October-December 2019, the count of cases and the incidence rate of all reported cases of *E. coli* bacteraemia increased by 29.1% from 8,275 cases to 10,685 and from 61.8 to 75.3 cases per 100,000 population. Similarly, over the same period, the count of community-onset cases increased by 38.4% from 6,279 to 8,690, while the incidence rate increased 30.6% from 46.9 cases per 100,000 population to 61.3. The incidence rate of hospital-onset cases decreased 4.7% between July to September 2011 and October-December 2019 from 23.6 per 100,000 bed-days to 22.5 per 100,000 bed-days, although the count of cases remained similar at 1,996 and 1,995 respectively.

Between October-December 2019 and April to June 2020, following the start of the COVID-19 global pandemic, the total count and rate of infection fell 21.3% and 20.5% respectively from 10,685 to 8,406 and from 75.3 cases per 100,000 population to 59.9. Hospital-onset infections observed the sharpest decline during this period, with the count falling by 33.0% from 1,995 to 1,337, the lowest observed since the initiation of mandatory *E. coli* surveillance. Despite this reduction, there was an increase in the incidence rate of 7.3% from 22.5 cases per 100,000 bed-days to 24.1. This was largely due to the reduced hospital activity. The incidence rate of hospital-onset infection for April to June 2020 differs in this report to what was previously published due to more accurate hospital denominator data becoming available.

In July to September 2020 the count and rate of infection was 4.2% lower than the start October to December 2019 with 10,238 infections corresponding to 72.2 per 100,000 population, suggesting a return towards expected levels of reporting. While this increase from April to June 2020 is encouraging, it is, as yet, unclear if this is a return towards pre-pandemic levels of reporting or the effects of seasonality that we would typically expect see in the July to September periods. Another way to quantify the decline is by comparing the most recent quarter (July to September 2020) to the same period in the previous year (July to September 2019). This comparison shows a 13.4% decrease in

the count of all reported cases from 11,821 to 10,238, while the incidence rate also decreased 13.4% from 83.3 per 100,000 population to 72.2. Hospital-onset *E. coli* bacteraemia cases and incidence rate decreased 18.5% from 2,026 to 1,652 and from 23.5 to 19.2 per 100,000 bed-days. Community-onset *E. coli* bacteraemia cases decreased 12.3% from 9,795 to 8,586 per 100,000 bed-days, while the community-onset incidence rate decreased 12.3% from 69.0 per 100,000 population to 60.5 (figures 1a and 1b, table S1).

As mentioned previously, there is typically a strong seasonality to the incidence of all-reported *E. coli* bacteraemia cases, with the highest rates observed between July to September of each year. There is less evidence of the same seasonality among hospital-onset cases, though a summer peak is observed in financial years 2015 to 2016, 2016 to 2017 and 2018 to 2019.

Figure 1a: Quarterly rates of all reported E. coli bacteraemia: July to September 2011 to July to September 2020

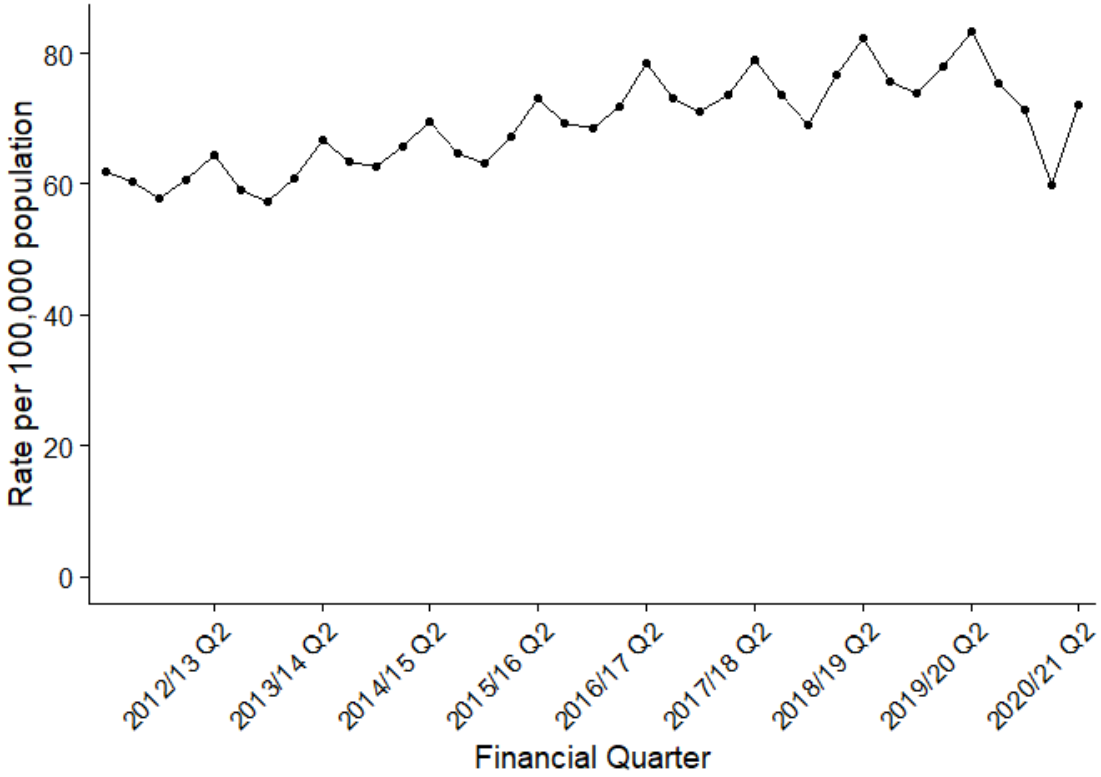
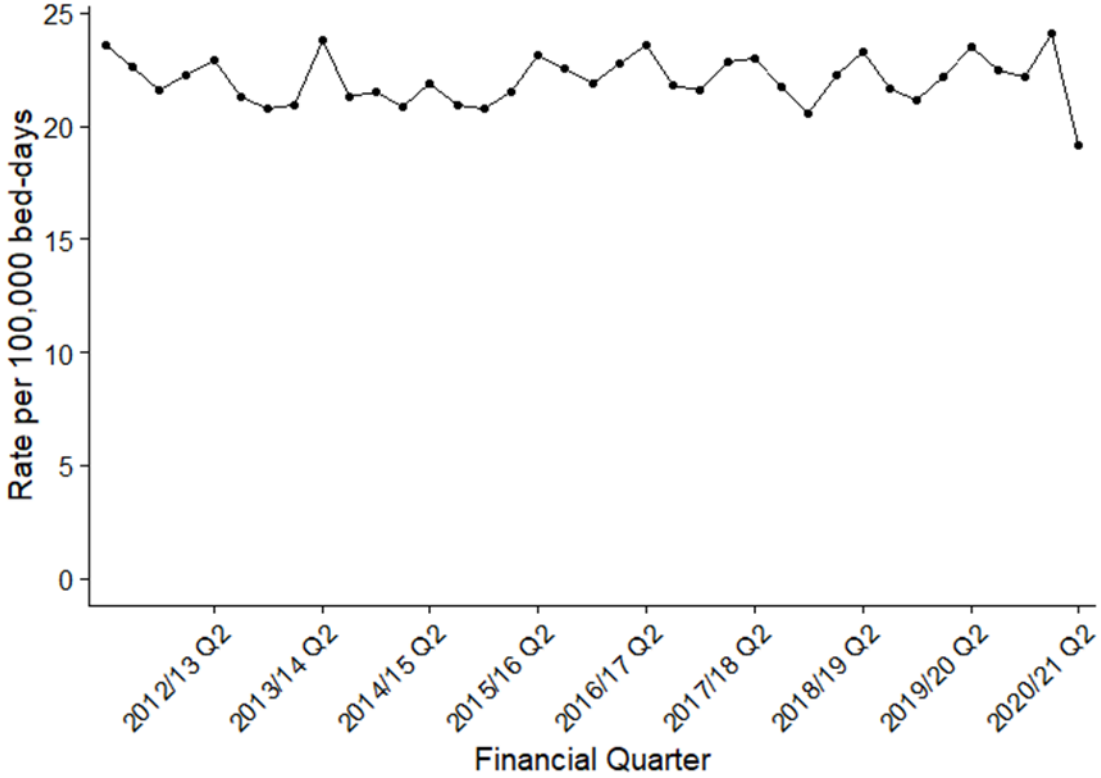


Figure 1b: Quarterly rates of hospital-onset *E. coli* bacteraemia: July to September 2011 to July to September 2020



Klebsiella spp. bacteraemia

Between April to June 2017 and July to September 2020, there was a 22.7% increase in the count of all reported *Klebsiella* spp., from 2,348 to 2,882, and a 20.0% increase in the incidence rate, from 16.9 to 20.3 cases per 100,000 population respectively (figure 2a). The count and the incidence rate of community-onset cases also increased by 23.2% from 1,678 to 2,067 cases and by 20.4% from 12.1 to 14.6 cases per 100,000 population respectively. Over the same period, the count and the incidence rate of hospital-onset cases increased by 21.6% from 670 to 815 cases and by 21.9% from 7.8 cases per 100,000 bed-days to 9.5 respectively (figure 2b).

During April to June 2020 the rate of hospital-onset cases increased to 13.9 from 8.7 per 100,000 bed-days when compared to the same period in the previous year (April to June 2019). However, the count of cases remained similar at 772 and 748 respectively. This increase to the rate is largely due to the reduction in hospital bed-days during this period. The incidence rate of hospital-onset infection for April to June 2020 differs in this report to what was previously published due to more accurate hospital denominator data becoming available.

The lower levels of reporting for *Klebsiella* spp. due to the global pandemic are not as obvious as they are for *E. coli*. The reduction can, in part, be shown by comparing all reported cases for the most recent quarter (July to September 2020) to the same period in the previous year (July to September 2019), which shows a 3.4% decrease in the count of all reported cases and the incidence rate from 2,982 to 2,882 and from 21.0 per 100,000 population to 20.3. Hospital-onset *Klebsiella* spp. cases and incidence rate decreased 9.1% from 897 to 815 and from 10.4 to 9.5 per 100,000 bed-days. Community-onset *Klebsiella* spp. cases and incidence rate decreased 0.9% from 2,085 to 2,067 and from 14.7 to 14.6 per 100,000 population (table S2).

During July to September 2020, 69.1% (1,992/2,882) of all reported *Klebsiella* spp. bacteraemia were caused by *K. pneumoniae*, this is a decrease compared to the 72.7% in the same quarter in the previous year (July to September 2019). Over the same period 19.6% (566/2,882) were caused by *K. oxytoca* in July to September 2020, an increase from 17.0% in the same quarter in the previous year (July to September 2019).

Figure 2a: Quarterly rates of all reported *Klebsiella* spp. bacteraemia by species: April to June 2017 July to September 2020

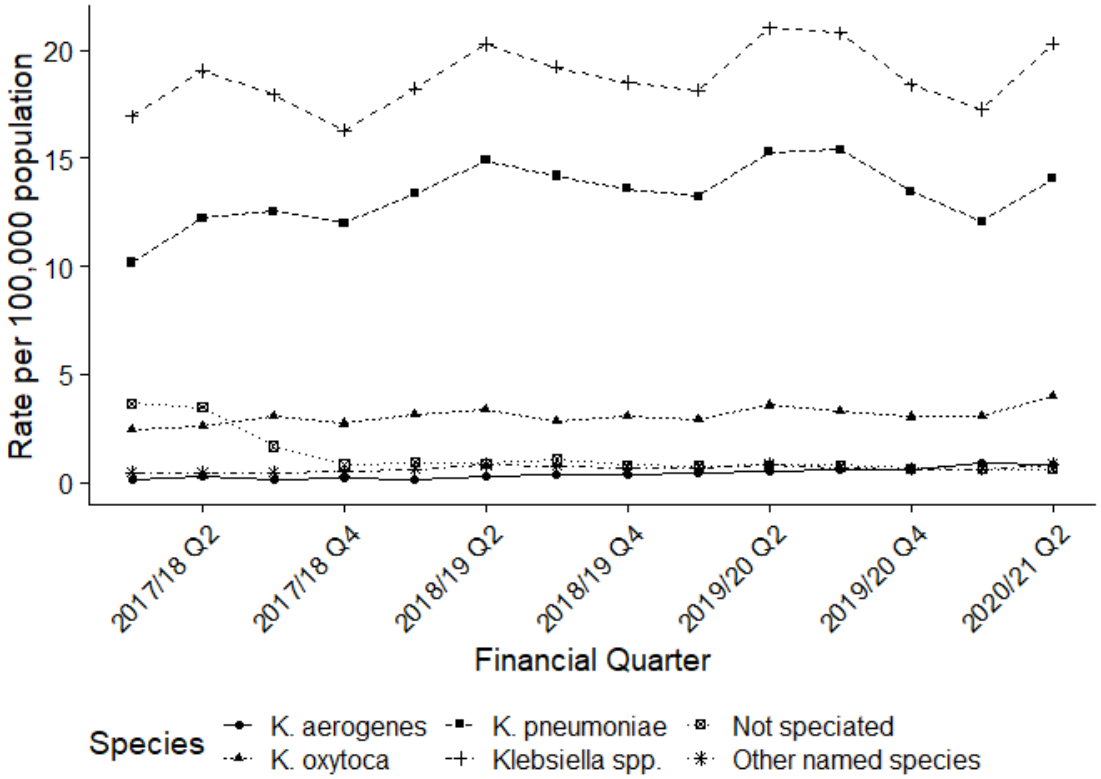
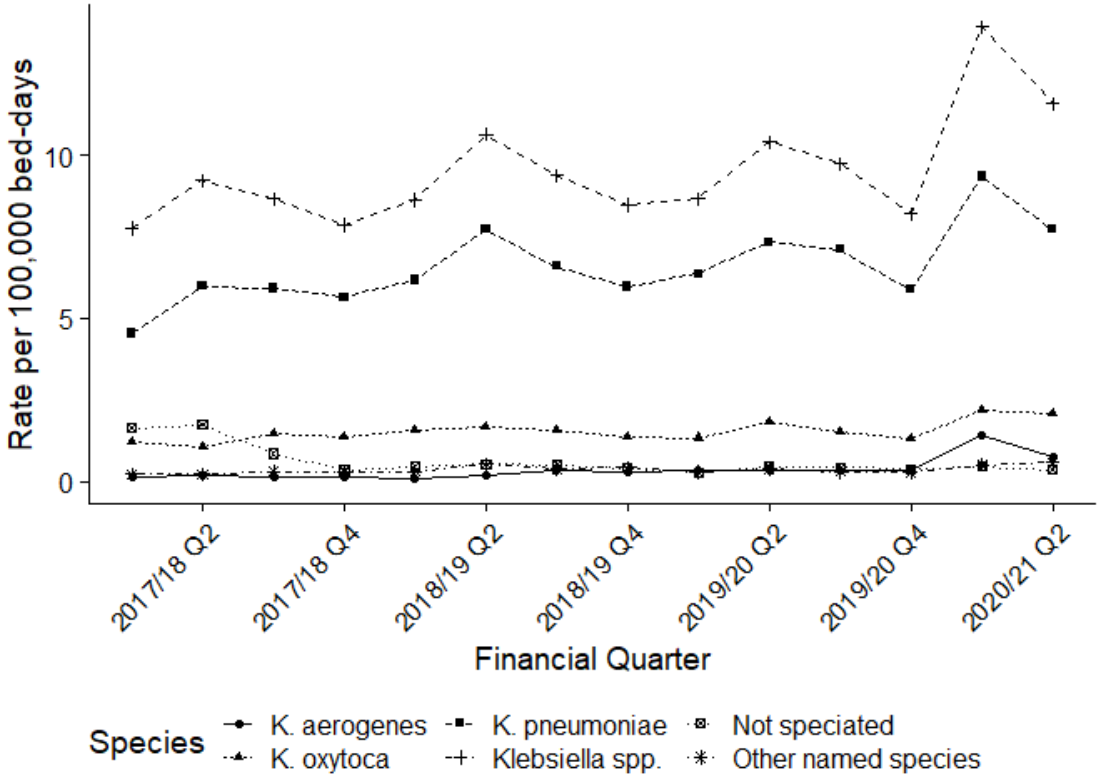


Figure 2b: Quarterly rates of hospital-onset *Klebsiella* spp. bacteraemia: April to June 2017 to July to September 2020



Pseudomonas aeruginosa bacteraemia

Between April to June 2017 and July to September 2020, there was a 19.0% increase in the count and a 16.3% increase in the incidence rate of all reported *P. aeruginosa* bacteraemia cases from 1,012 to 1,204 and from 7.3 to 8.5 cases per 100,000 population respectively (figure 3a). The count and the incidence rate of community-onset cases also increased by 25.1% from 638 to 798 cases and by 22.3% from 4.6 to 5.6 cases per 100,000 population respectively. Over the same period, the count and the incidence rate of hospital-onset cases increased by 8.6% from 374 to 406 cases and by 8.8% from 4.3 to 4.7 cases per 100,000 bed-days respectively (figure 3b).

A reduction to the total bed-days in occupancy during the April to June 2020 period resulted in an increase to the rate of hospital-onset cases to 5.5 from 4.6 per 100,000 bed-days when compared to the same period in the previous year (April to June 2019). This increase to the rate was observed despite the count of cases declining to 303 from 398. The incidence rate of hospital-onset infection for April to June 2020 differs in this report to what was previously published due to more accurate hospital denominator data becoming available.

Comparing the most recent quarter (July to September 2020) to the same period in the previous year (July to September 2019) shows a 0.6% increase in the count of all reported cases from 1,197 to 1,204, while the incidence rate increased 0.6% from 8.4 to 8.5. Hospital-onset *P. aeruginosa* cases increased 1.0% from 402 to 406 which corresponds to the incidence rate remaining at 4.7 per 100,000 bed-days. Community-onset *P. aeruginosa* cases increased 0.4% from 795 to 798 per 100,000 population, while the community-onset incidence rate remained at 5.6 per 100,000 population (table S3).

There is evidence of seasonality to the incidence of all-reported *P. aeruginosa* bacteraemia cases, with the highest rates observed in July to September of each year.

Figure 3a: Quarterly rates of all reported *P. aeruginosa* bacteraemia: April to June 2017 to July to September 2020

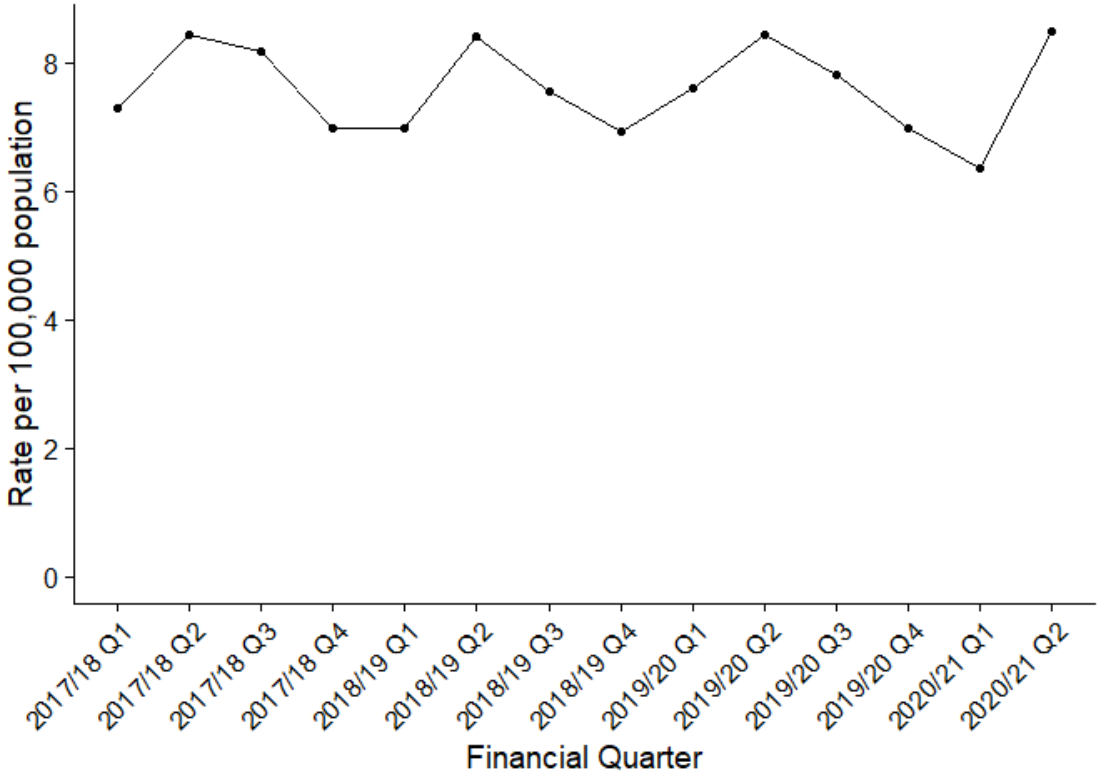
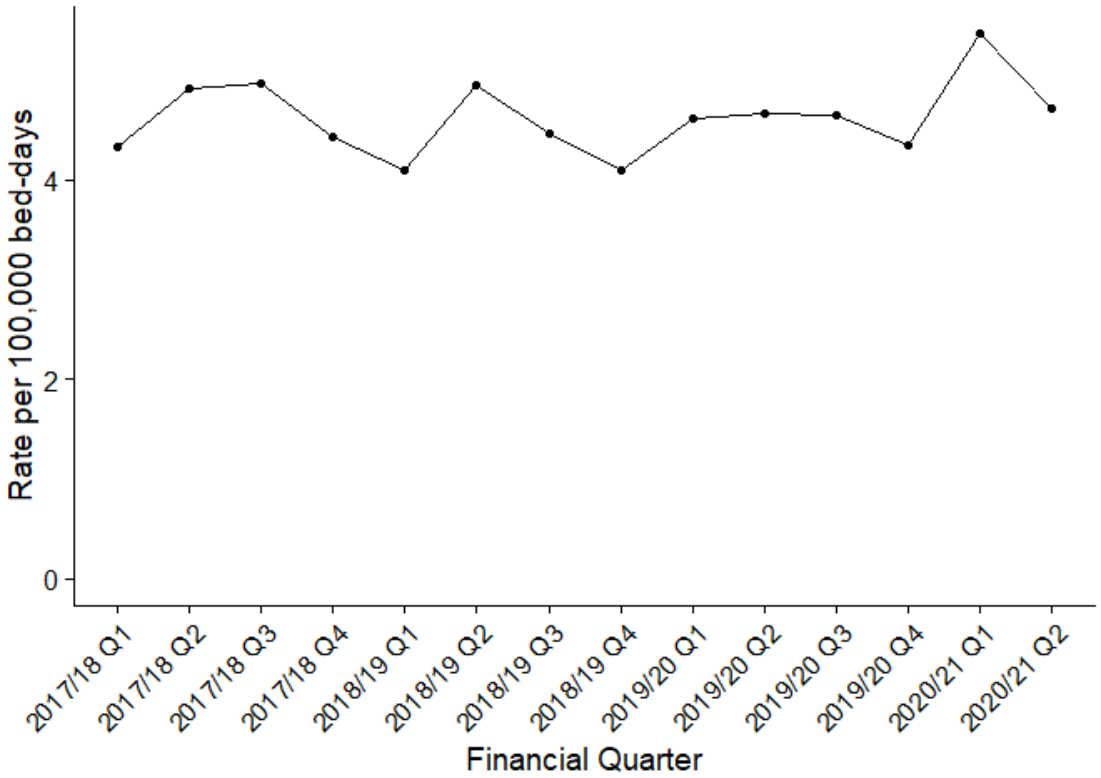


Figure 3b: Quarterly rates of hospital-onset *P. aeruginosa* bacteraemia: April to June 2017 to July to September 2020



Epidemiological analyses of *Staphylococcus aureus* bacteraemia data

MRSA bacteraemia

There has been a considerable decrease in the incidence rate of all reported MRSA bacteraemia since the enhanced mandatory surveillance of MRSA bacteraemia began in April 2007 (figures 4a, table S4). The incidence rate of all reported cases fell by 85% from 10.2 cases per 100,000 population April to June 2007 to 1.5 cases per 100,000 in January to March 2014. The rate has subsequently decreased to 1.0 cases per 100,000 population between January to March 2014 and July to September 2020.

A similar trend was observed with the incidence rate of hospital-onset cases (figures 4b, table S4). There was a steep decrease of 79% from 4.9 cases per 100,000 bed-days in April to June 2008 to 1.0 in January to March 2014. Subsequently, between January to March 2014 and July to September 2020, the rate has decreased to 0.6 cases per 100,000 bed-days.

The April to June 2020 period had a reduction to the total bed-days in occupancy and resulted in an increase to the rate of hospital-onset cases to 1.0 from 0.6 per 100,000 bed-days, when compared to the same period in the previous year (April to June 2019). This increase to the rate was observed despite the count of hospital-onset cases remaining broadly similar at 57 and 52 respectively. The incidence rate of hospital-onset infection for April to June 2020 differs in this report to what was previously published due to more accurate hospital denominator data becoming available.

The effect that the COVID-19 pandemic has had on MRSA incidence is evident when comparing the most recent quarter (July to September 2020) to the same period in the previous year (July to September 2019), which shows a 30.0% decrease in the count of all reported cases, from 200 to 140, while the incidence rate decreased 30.0% from 1.4 to 1.0 cases per 100,000 population. The count of hospital-onset MRSA bacteraemia cases and incidence rate decreased 25.8% from 66 to 49 and from 0.8 to 0.6 per 100,000 bed-days. Community-onset MRSA bacteraemia cases and incidence rate decreased 32.1% from 134 to 91 and from 0.9 to 0.6 cases per 100,000 population (table 4b).

Figure 4a: Quarterly rates of all reported MRSA bacteraemia: April to June 2007 to July to September 2020

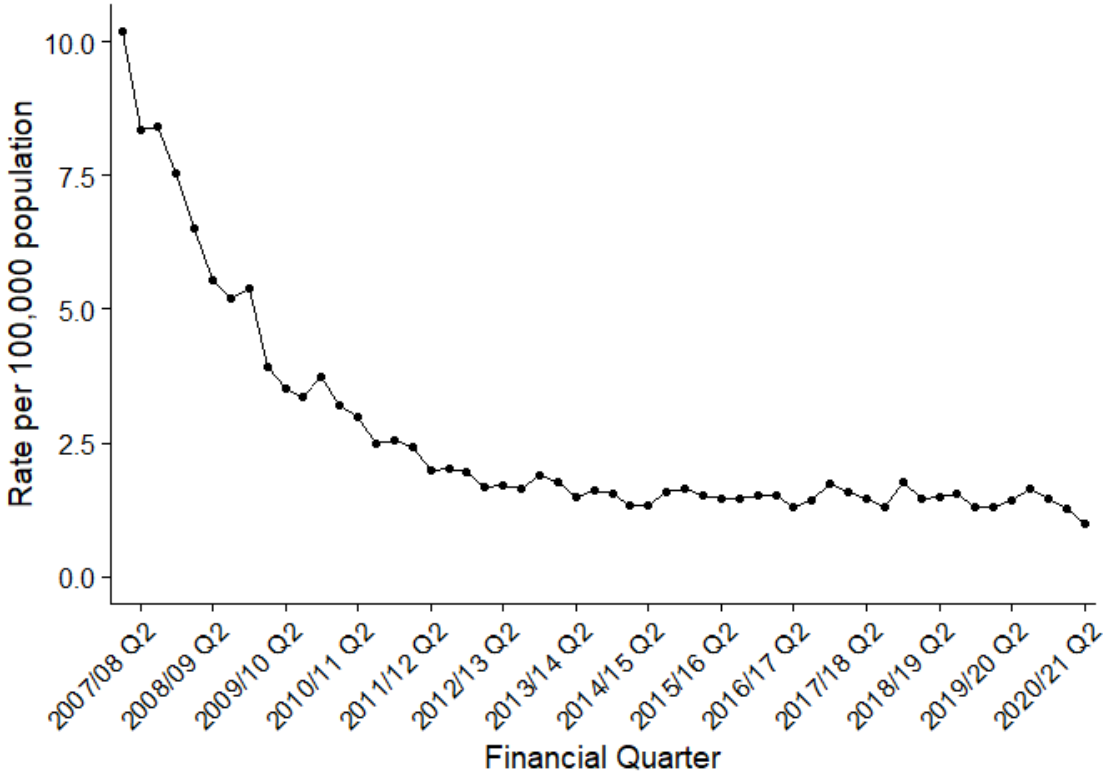
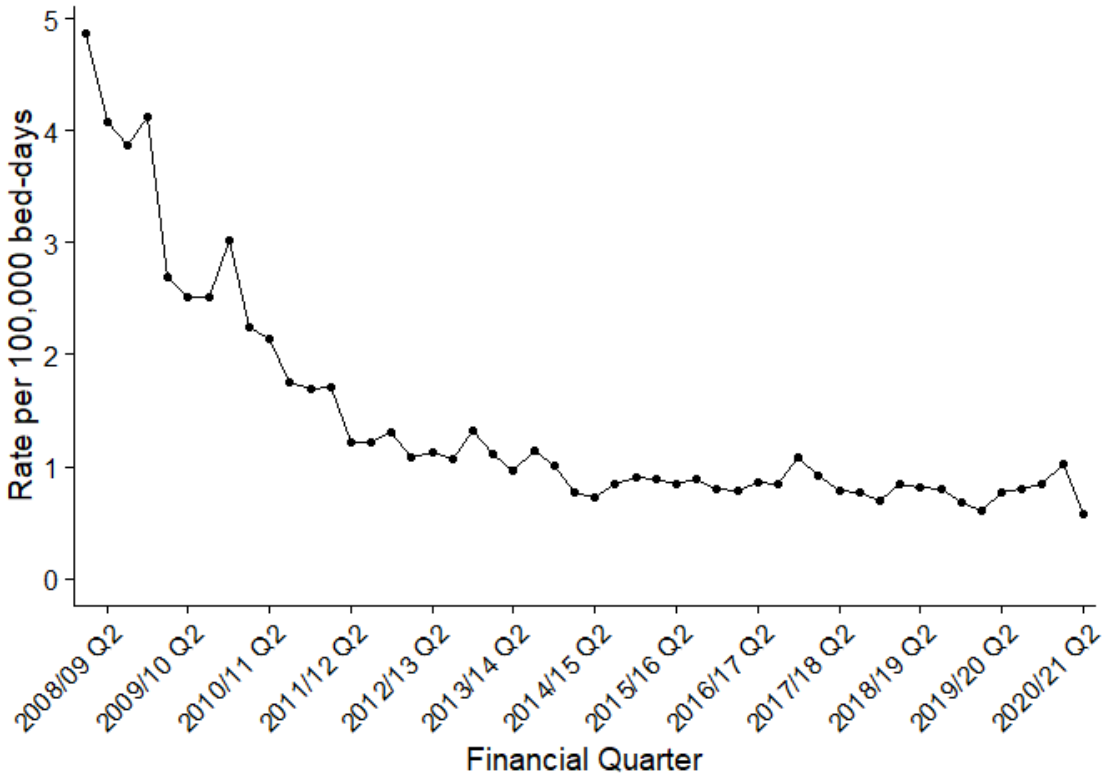


Figure 4b: Quarterly rates of hospital-onset MRSA bacteraemia: April to June 2008 to July to September 2020



MSSA bacteraemia

Since the mandatory reporting of MSSA bacteraemia began in January 2011, there has been a general trend of increasing counts and incidence rates. The count of all reported cases of MSSA bacteraemia increased by 30.3% from 2,199 to 2,866 between January to March 2011 and July to September 2020. This was accompanied by a 20.3% increase in incidence rate from 16.8 per 100,000 population to 20.2 (figure 5a, table S5).

These increases are primarily driven by the increase in community-onset cases. Between January 2011 and July to September 2020, the count and the incidence rate of community-onset cases increased by 40.0% and 29.2% respectively from 1,464 to 2,049 cases and from 11.2 to 14.4 cases per 100,000 population. Over the same period, the count of hospital-onset cases increased by 11.2% from 735 to 817 cases, while the incidence rate increased 13.7% from 8.3 to 9.5 cases per 100,000 bed-days (figure 5a and 5b, table S5).

During April to June 2020 the rate of hospital-onset cases increased to 11.5 from 9.8 per 100,000 bed-days when compared to the same period in the previous year (April to June 2019). However, the count of hospital-onset cases declined to 637 from 849. This increase to the rate is largely due to the reduction in hospital bed-days during this period. The incidence rate of hospital-onset infection for April to June 2020 differs in this report to what was previously published due to more accurate hospital denominator data becoming available.

To better demonstrate the reduced levels of incidence associated with the COVID-19 pandemic, we can compare the most recent quarter (July to September 2020) to the same period in the previous year (July to September 2019), which shows a 9.5% decrease in the count of all reported cases and incidence rate from 3,166 to 2,866 and from 22.3 to 20.2. Community-onset MSSA bacteraemia cases decreased 11.6% from 2,318 to 2,049, while the community-onset incidence rate decreased the same amount from 16.3 to 14.4 per 100,000 population. Hospital-onset MSSA bacteraemia were more comparable to the previous year, although cases of infection and incidence rate decreased 3.7% from 848 to 817 and from 9.8 to 9.5 per 100,000 bed-days.

Figure 5a: Quarterly rates of all reported MSSA bacteraemia: January to April 2011 to July to September 2020

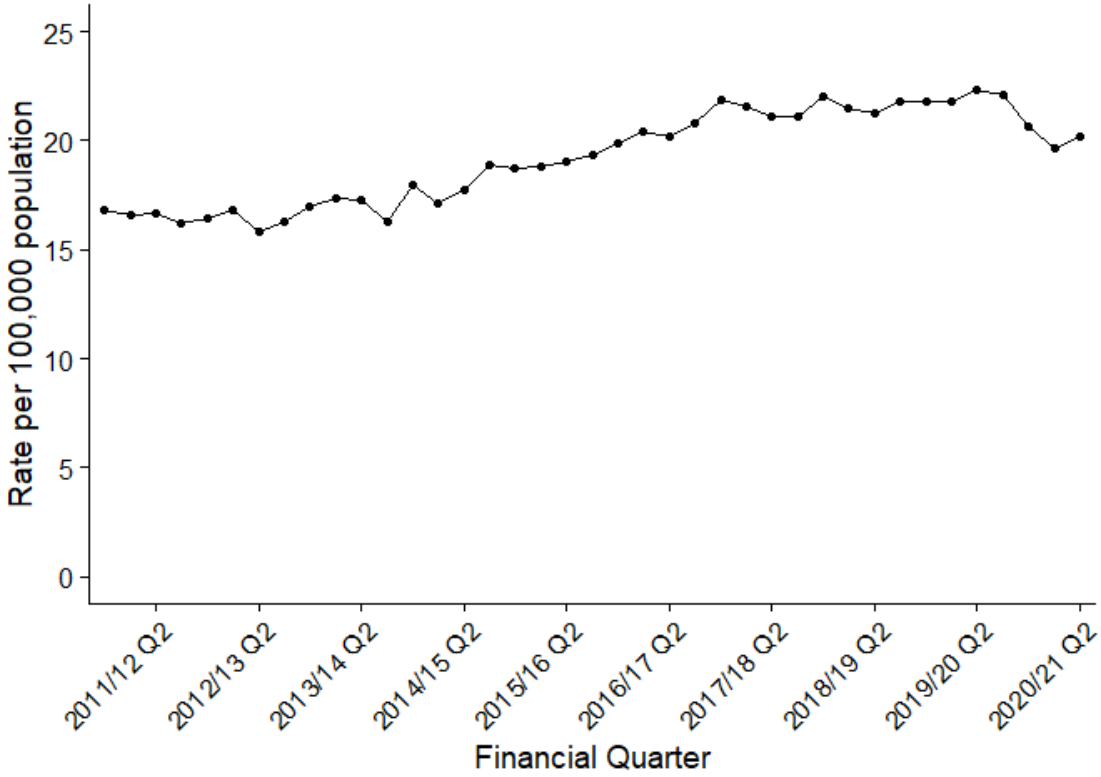
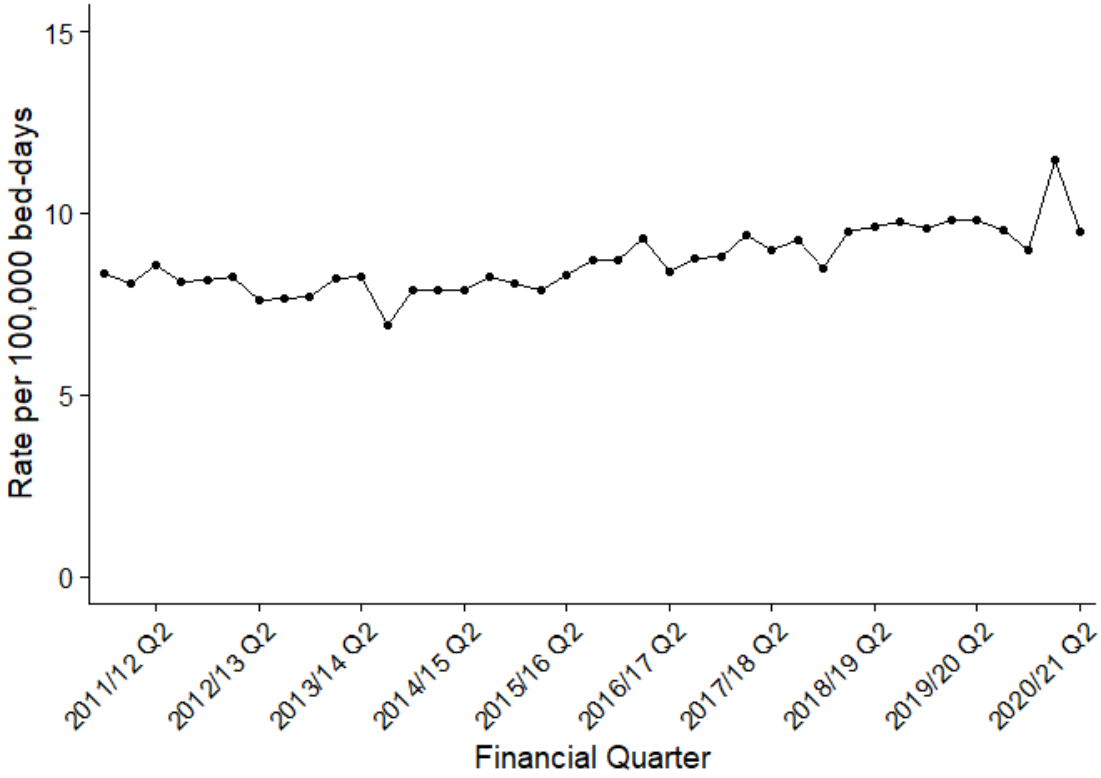


Figure 5b: Quarterly rates of hospital-onset MSSA bacteraemia: January to April 2011 to July to September 2020



Epidemiological analyses of *Clostridioides difficile* infection data

Since the initiation of *C. difficile* (CDI) surveillance in April 2007, there has been an overall decrease in the count and associated incidence rate of both all-reported and hospital-onset cases of CDI (figure 6a, 6b and table S6).

Most of the decrease in the incidence rate occurred between April to June 2007 and January to March 2012, with a 78.0% decrease in all-reported cases of CDI from 16,864 to 3,711 cases and an associated 78.9% reduction in incidence rate from 131.6 cases per 100,000 population to 27.9. Subsequently, between January to March 2012 and July to September 2020, the count of all-reported cases decreased 6.1% from 3,711 to 3,484 cases and the incidence rate reduced by 12.0% from 27.9 cases per 100,000 population to 24.6.

There were similar, but greater, reductions among hospital-onset CDI cases with an 84.5% reduction in count of cases between April to June 2007 and January to March 2012 from 10,436 to 1,613 cases and 83.9% reduction in the incidence rate from 112.1 per 100,000 bed-days to 18.1. This was followed by a further 30.9% decrease in the count of cases from 1,613 to 1,114 cases and a decrease of 28.6% in the incidence rate from 18.1 cases per 100,000 bed-days to 12.9 between January to March 2012 and July to September 2020.

CDI observed a similar trend as the bacteraemias during the April to June 2020 period. The rate of hospital-onset cases increased to 15.9 from 12.5 per 100,000 bed-days when compared to the same period in the previous year (April to June 2019). This increase occurred despite the count of hospital-onset cases declining to 883 from 1,076. This increase to the rate is largely due to the reduction in hospital bed-days during this period. The incidence rate of hospital-onset infection for April to June 2020 differs in this report to what was previously published due to more accurate hospital denominator data becoming available.

A better indicator of how the COVID-19 pandemic has affected counts and rates of CDI is by comparing the most recent quarter (July to September 2020) to the same period in the previous year (July to September 2019) which shows a 4.3% decrease in the count of all reported cases and total incidence rate from 3,639 to 3,484 and from 25.6 cases per 100,000 population to 24.6. Hospital-onset CDI cases and incidence rate decreased 8.0% from 1,211 to 1,114 and from 14.0 cases per 100,000 bed-days to 12.9. Community-onset CDI cases and incidence rate decreased 2.4% from 2,428 to 2,370 and from 17.1 per 100,000 population to 16.7.

Figure 6a: Quarterly rates of all reported *C. difficile*: April to June 2007 to July to September 2020

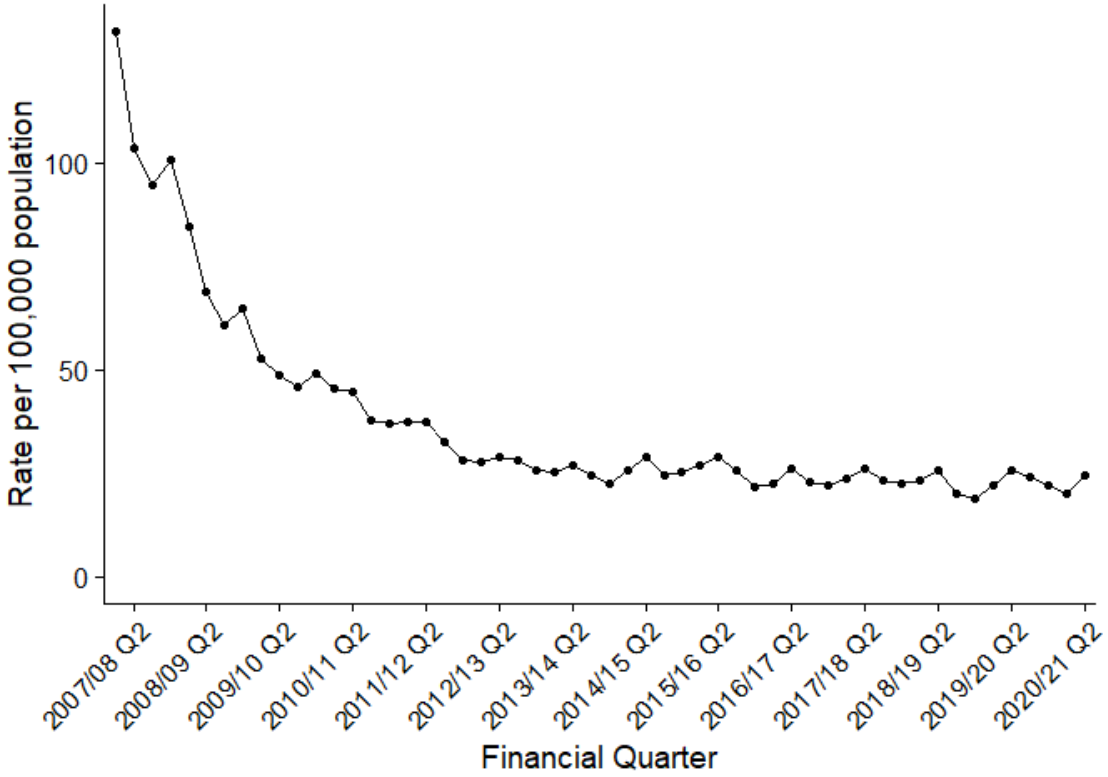
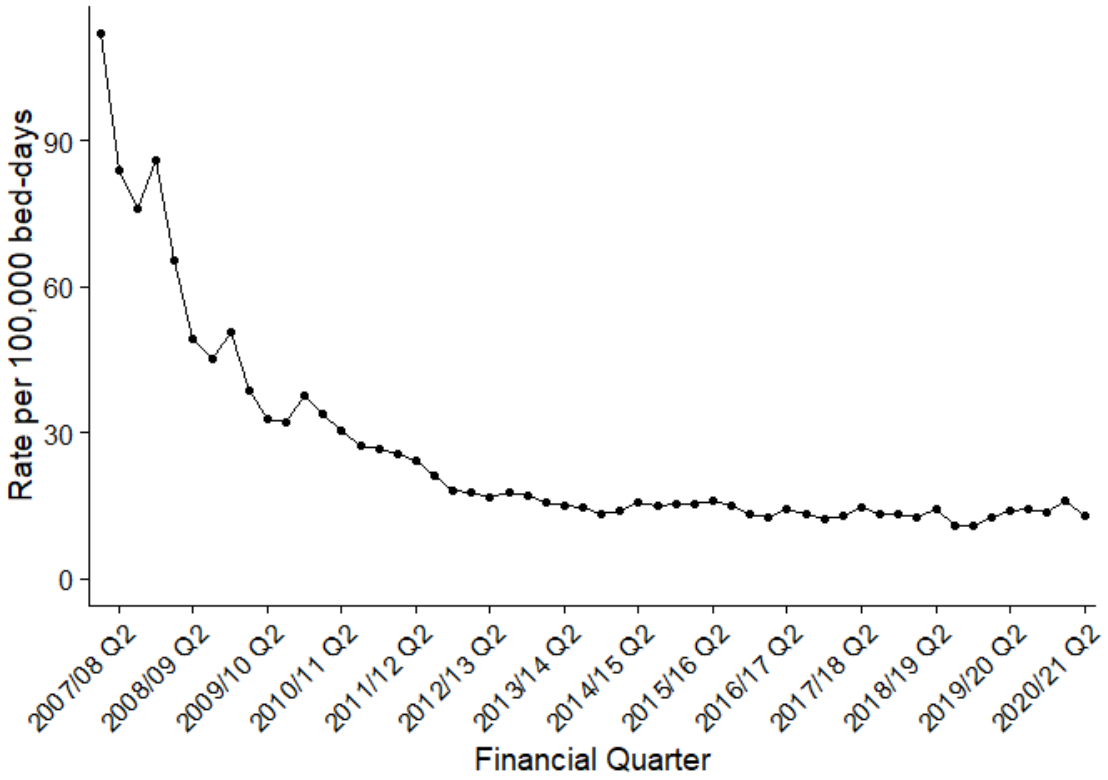


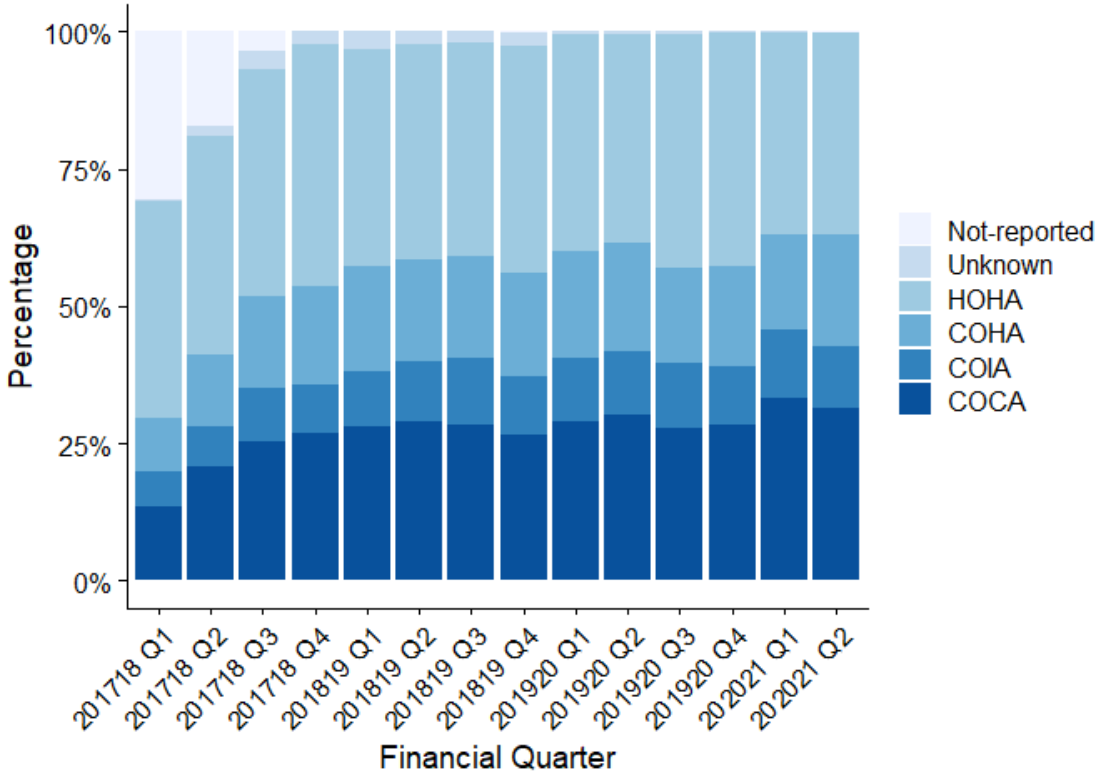
Figure 6b: Quarterly rates of hospital-onset *C. difficile*: April to June 2007 to July to September 2020



From April 2017, the HCAI DCS has included questions relating to prior trust exposure to the same acute trust reporting the CDI case. These additional, mandatory, items help align English CDI surveillance with definitions used by the European Centre for Disease Prevention and Control (ECDC) and Centers for Disease Control and Prevention (CDC) in the USA. Cases are now categorised as: Healthcare-Onset, Healthcare Associated (HOHA), Community-Onset, Healthcare Associated (COHA), Community-Onset, Indeterminate Association (COIA) or Community-Onset, Community Associated (COCA). Cases where prior admission details were recorded as 'Don't know', are assigned as 'Unknown' and those with missing information as ''Not-reported'.

Between April to June 2017 and July to September 2020 the largest proportion of cases were HOHA. While there have been some fluctuations, the proportion has remained broadly stable at around 40% of all cases. Over the same period, COCA cases increased from 13.4% to 31.5% of all CDI, although most of this increase was observed during 2017/18. COHA cases have increased from 9.7% to 20.3% of all CDI, with most of the increase being observed during 2017/18. COIA cases have increased from 6.3% to 11.2% of all CDI. Much of the increase observed is likely due to improved data quality as shown by the sharp decline of cases with missing data (figure 7 table S7).

Figure 7: CDI rates by prior trust exposure April 2017 – July to September 2020



Appendix

Bed-day data

For bacteraemia and CDI, the average bed-day activity reported by acute trusts via KH03 returns is used to derive the bed-day denominator for acute trust incidence rate rates (assigned and apportioned). As of Q1 2011/12, bed-day data has been available on a quarterly basis and has been used as such for Q2 2011/12 to Q4 2019/20. This data is available at: www.england.nhs.uk/statistics/statistical-work-areas/bed-availability-and- occupancy/bed-data-overnight/

Amendments to the published figures on KH03 included the following.

Q2 2020/21 bed-day data was not available at the time of writing this report; therefore, bed-day data for the same quarter of the previous year (Q2 2019/20) was used as a proxy for this quarter.

In Quarterly Epidemiological Commentaries published prior to 1 December 2015, April to June 2014 to October to December 2014 quarterly KH03 figures for one acute trust (RWD) had a percentage change of more than 20% compared with the previous quarter and the same quarter in the previous year. As a result, it was replaced with the KH03 data of the same quarter in the previous year (April to June 2013 to October to December 2013).

However, PHE has reviewed its policy for processing KH03 data. Data irregularities identified have been flagged with colleagues at NHS England (data owners of the KH03 dataset). Until we receive confirmation that any identified change in the occupied overnight bed-days for an acute trust is anomalous, PHE now uses the data as published in the KH03 dataset. This affects all reports published since 1 December 2015 and incidence rate rates published prior that time will differ slightly as a result. For the KH03 data used to calculate rates included in this report to be consistent over the full-time period, previously amended KH03 data for trust United Lincolnshire Hospitals (RWD) for FY 2014/2015 has been altered to reflect that published in the KH03 dataset. Please note that this could lead to slight differences in hospital- onset/assigned rates when compared with publications prior to 1 December 2015.

Missing data for acute trusts in the KH03 returns will continue to be processed as before, where the KH03 return for the same quarter from the previous year will be used as a proxy. The following acute trusts were thus affected:

- Moorfields Eye Hospital NHS Foundation Trust (RP6) 2007/08 and 2008/09 KH03 figures: replaced with 2006/07 KH03 figure

- Rotherham NHS Foundation Trust (RFR): 2009/10 and April-June 2010 to April-June 2011 KH03 figures: replaced with 2008/09 KH03 figure
- Sheffield Teaching Hospitals NHS Foundation Trust (RHQ) April-June 2010 to April-June 2011 KH03 figures: replaced with 2009/10 KH03 data
- The Princess Alexandra Hospital NHS Trust (RQW) April-June 2014 and October-December 2014 KH03 figures: replaced with April-June 2013 to October-December 2013 KH03 figures, respectively
- Ipswich Hospital NHS Trust (RGQ) January-March 2016 KH03 figure: replaced with January-March 2015 figures
- West Suffolk NHS Foundation Trust (RGR) April-June 2016 to October-December 2016 and April-June 2017 KH03 figures: replaced with April-June 2015 to October-December 2015 KH03 figures
- Gloucestershire Hospitals NHS Foundation Trust (RTE) October-December 2016 to January-March 2017 KH03 figures: replaced with October-December 2015 to January-March 2016 KH03 figures

The KH03 data used for this report was published on 20th August 2020. This includes revisions of previously published KH03 data and so these data may differ from those used in earlier reports.

Population data

National incidence rates are calculated using 2007 to 2018 mid-year resident population estimates which are based on the 2011 census for England (2020 estimates are based on 2019 mid-year estimates).

Definitions

Bacteraemia hospital-onset (trust-apportioned) cases

Include patients who are (i) in-patients, day-patients, emergency assessment patients or not known; AND (ii) have had their specimen taken at an acute trust or not known; AND (iii) specimen was taken on or after day 3 of the admission (admission date is considered day ‘one’). Cases that do not meet these criteria are categorised as community-onset (not-trust apportioned).

CDI hospital-onset (trust-apportioned) cases

Include patients who are (i) in-patients, day-patients, emergency assessment patients or not known; AND (ii) have had their specimen taken at an acute trust or not known; AND (iii) specimen was taken on or after day 4 of the admission (admission date is considered day ‘one’). Cases that do not meet these criteria are categorised as community-onset (not-trust apportioned).

Historically, report published before September 2017 have used the term ‘trust-apportioned’ to describe cases meeting the above conditions for apportionment and ‘not trust-apportioned’ for those that do not. Moving forward, these terminologies have been updated to ‘hospital-onset’ and ‘community-onset’ respectively. Please note that this is simply a change in terminology and does not constitute a change in the methodology for apportionment.

Prior trust exposure

From April 2017, reporting trusts were asked to provide information on whether patients with CDI had been admitted to the reporting trust within the 3 months prior to the onset of the current case. This allows a greater granulation of the healthcare association of cases.

Cases are split into one of 6 groups:

Hospital-onset healthcare-associated - Date of onset is > 2 days after admission (where day of admission is day 1).

Community-onset healthcare-associated - Date of onset is ≤ 2 days after admission and the patient was admitted to the trust in the 4 weeks prior to the current episode

Community-onset indeterminate association - Date of onset is ≤ 2 days after admission and the patient was admitted in the previous 12 weeks, but not the previous 4 weeks prior to the current episode.

Community-onset community-associated - Date of onset is ≤ 2 days after admission and the patient had not been admitted to the trust in the previous 12 weeks prior to the current episode.

Unknown 3 months - The reporting trust answered, "Don't know" to the question regarding admission in the 3 months prior to the current episode.

All unknown - The reporting trust did not provide any answer for questions on prior admission.

Total reported cases

This is the total count of infections for each organism as of the date of extraction. Please note that for *C. difficile*, this count excludes those from patients less than 2 years old.

Episode duration

The length of an infection episode is defined as 14 days for MRSA, MSSA, *E. coli*, *Klebsiella* spp. and *P. aeruginosa* bacteraemia and 28 days for CDI, with the date of specimen being considered day 'one'.

Incidence rate calculations

MRSA, MSSA and *E. coli*, *Klebsiella* spp., *P. aeruginosa* bacteraemia, and CDI population incidence rate (episodes per 100,000):
This incidence rate is calculated using the mid-year England population and is

$$= \frac{\text{n episodes}}{\left(\frac{\text{mid-year population for England}}{\text{days in quarter}}\right)} \times 100{,}000$$

MRSA, MSSA and *E. coli*, *Klebsiella* spp., *P. aeruginosa* and CDI hospital-onset incidence:
This incidence rate is calculated using KH03 average bed-day activity (see bed-day data above) and is calculated as follows:

$$= \frac{\text{n episodes}}{\text{average KH03 beds per day} \times \text{days in quarter}} \times 100{,}000$$

Graphs and percentage change calculation

Please note that percentage changes in rate have been calculated using raw rate figures while those presented in the tables and commentary have been rounded to one decimal place. Similarly, graphs included in this report were plotted using raw rates figures. The raw rate figures are included in the accompanying Quarterly Epidemiological Commentary's accompanying data.

Quarters

In publications prior to March 2016, all references to quarterly data are based on calendar year definitions and NOT financial year definitions, that is:

- Q1 2014: April to June 2014
- Q2 2014: April to June 2014
- Q3 2014: July to September 2014
- Q4 2014: October to December 2014

However, for all subsequent publications, including this one, all references to quarterly data are based on financial year definitions and NOT calendar year definitions, that is:

- Q1 2014/15: April to June 2014

- Q2 2014/15: July to September 2014
- Q3 2014/15: October to December 2014
- Q4 2014/15: April to June 2015

About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-leading science, research, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health and Social Care, and a distinct delivery organisation with operational autonomy. We provide government, local government, the NHS, Parliament, industry and the public with evidence-based professional, scientific and delivery expertise and support.

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